

Site Master™ S331P

**Ultraportable Cable and Antenna Analyzer
Featuring Classic and Advanced Modes**

150 kHz to 4 GHz (S331P-0704 Option)

150 kHz to 6 GHz (S331P-0706 Option)

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Chapter 1 — General Information

1-1 Introduction

The Site Master S331P User Guide describes the instrument's system and file management functions and explains how to perform Cable and Antenna measurements.

About this Manual

This chapter provides an overview of the Site Master S331P Cable and Antenna Analyzer and a description of manual conventions and additional documentation.

[Chapter 2, “Installation”](#) contains information on software installation and an overview of the graphical user interface.

[Chapter 3, “Cable and Antenna Measurements”](#) gives an overview of line sweeping and describes instrument functions in Cable and Antenna Analyzer Advanced Mode.

[Chapter 4, “Classic Mode Operation”](#) describes the menus available in the Classic Cable and Antenna Analyzer measurement mode, which emulates the user interface from the Anritsu “D” series Site Master instruments.

[Chapter 5, “Calibration”](#) describes the calibration methods available.

[Chapter 6, “File Management”](#) reviews the file management features of the Site Master using the **File** menu and the **Save** menu. These menus allow the user to save, recall, copy, and delete files on the external computer or storage device.

[Chapter 7, “System Operations”](#) reviews various instrument management features of the Site Master including: System menu, Preset menu, and Help menu.

[Chapter 8, “Anritsu Tool Box”](#) provides an overview of the Anritsu Line Sweep Tools (LST) and easyTest Tools.

Document Conventions

Main menu and keypad keys are shown in the User Guide in a **Sans Serif Bold** typeface. Main menu keys are the six buttons displayed at the bottom of the interface screen. Submenus and submenu keys are located on the right side of the trace window and some dialog boxes. They are shown in this manual in **Sans Serif Regular** typeface.

Key sequences to access specific Site Master functions are represented in a manner similar to the following:

Freq/Dist > DTF Setup > Cable List

Because the S331P is controlled via a Graphical User Interface that runs on a tablet or PC, key actions may be described with the interchangeable terms *press*, *touch*, *tap*, or *click*.

Additional Documents

The following documents provide additional information about the Site Master S331P Ultraportable Cable and Antenna Analyzer.

- Handheld Instruments Product Information, Compliance, and Safety Guide (10100-00067). Provides important safety, legal, and regulatory notices. Read this guide *before* operating the equipment.
- Site Master S331P Technical Data Sheet (11410-00964). Includes general specifications, detailed measurement specifications for all available measurement modes, ordering information, and available accessories.
- Site Master S331P Product Brochure (11410-00978). Includes an overview of the of the Site Master instrument, ordering information, and accessories information.

1-2 Instrument Description

The Site Master S331P is a one-port, 150 kHz to 4 GHz (Option 704) or 150 kHz to 6 GHz (Option 706) ultraportable cable and antenna analyzer designed to make Return Loss, VSWR, Cable Loss, and Distance-To-Fault (DTF) measurements in the field. The analyzer is an integrated multi-functional test instrument that eliminates the need to carry multiple test sets.

The S331P has no external power supply. It is powered via USB and controlled from a Windows-based tablet or PC running the instrument software. Windows 7 or higher is required. The Site Master S331P application is delivered on a USB memory stick included with the instrument. Software updates are downloaded from the Anritsu website.

Measurement files, setup files, and interface screen captures can be saved to and recalled from the controller device (tablet or PC) or removable disk. A user-editable EZ Name Matrix allows users to configure complex sweep names quickly, saving hours of valuable time daily.

Anritsu Line Sweep Tools (LST) can be used with the Site Master to create reports, view and organize data, edit markers and limit lines, and perform trace analysis. LST is available for download on the Anritsu website. Refer to [“Line Sweep Tools \(LST\)” on page 8-1](#) for a brief overview.

Anritsu easyTest Tools provides a library of commands and a drag & drop interface for creating test sequences. The software is available on the Anritsu website.

- A developer creates an easyTest test sequence (.ett) file.
- To recall a test script, press the easyTest icon on the Menu Shortcut screen and select the file. Step-by-step instructions contained in the script will be displayed, simplifying the process of operating the instrument and completing the assigned tasks.

A Quick Start Guide, full use instructions, and sample .ett files are included with the easyTest Tools software. After installation, start the application and choose Help for additional information. Refer to [“easyTest Tools” on page 8-2](#) for an overview.

Available Options

The Site Master S331P Technical Data Sheet (part number 11410-00964) contains a list and description of available options.

Accessories

The Technical Data Sheet also provides a list and description of standard and optional accessories.

Chapter 2 — Installation

2-1 Introduction

Other than an RF test port and USB port, the Site Master S331P has no user controls on the instrument itself. All instrument functions are performed from an external PC controller, which can be a tablet or PC running Windows 7 or higher.

To control and operate the S331P using the Graphical User Interface:

1. Connect the instrument Micro USB connector to the PC controller USB port. A USB-A to Micro-B with latch cable is included.
2. Install the Site Master S331P application on the tablet or PC.
3. Launch the application.

This chapter provides installation instructions for the S331P software and gives an overview of the GUI.

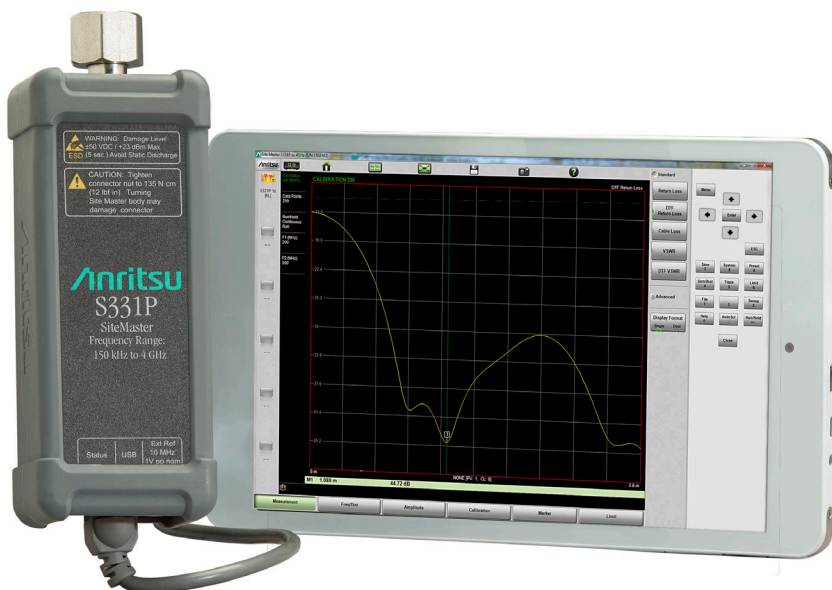


Figure 2-1. S331P and Tablet

2-2 Software Installation

The Site Master S331P application is delivered on a USB memory stick included with the instrument. The installer file name is of the form:

S331P_SiteMaster_Installer_VYYYY.MM.nnn.exe

where YYYYMM is the date stamp and nnn is the release version.

1. Copy the installer file to local disk on your tablet or PC.
2. Run the installer.

2-3 Software Update

Software updates are downloaded from the Anritsu website.

- 1.
2. Go to the Downloads page and download the installer to your tablet or PC.
3. Run the installer.

2-4 User Interface Overview

The S331P Graphical User Interface consists of a trace window, function menu keys, shortcut tool bars, and a virtual keypad on the right.

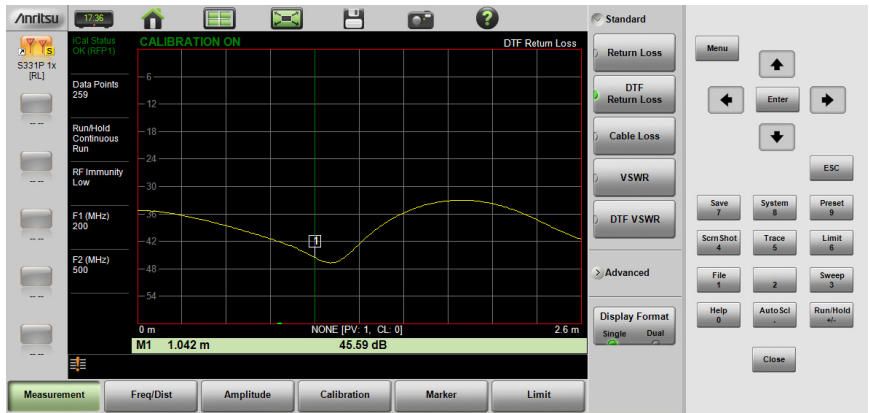


Figure 2-2. S331P User Interface

Virtual Keypad

Table 2-1 provides a description of user keys on the virtual keypad of the S331P interface screen. The numeric keys are used to access functions listed in the table and also to enter numerical digits when a parameter edit box is open.

Table 2-1. Site Master Keypad Functions (1 of 3)




Key	Description
	Opens the Menu Shortcut window, where you can switch between Cable-Antenna Analyzer Advanced and Classic Modes. Refer to “Menu Shortcut Window” on page 2-6.
	Applies a user-specified setting or executes the currently selected action.
	Moves or scrolls up a list.

Table 2-1. Site Master Keypad Functions (2 of 3)





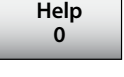

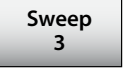
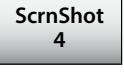

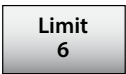

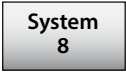




Key	Description
	Moves or scrolls down a list.
	In File Management, closes the currently selected folder (that is, moves up one folder level). When a marker is selected (red vertical line), moves the marker left.
	In File Management, opens the currently selected folder (that is, moves down one folder level). When a marker is selected (red vertical line), moves the marker right.
	Cancels a parameter value being entered or closes the current dialog box or screen without applying changes.
	Accesses the Help feature, where you can view system information and a list of Frequently Asked Questions (FAQ), or open this manual in a browser page. Refer to “Help” on page 7-3 .
	Allows the user to save, recall, copy, and delete files in local or removable disk. Refer to “File Menu” on page 6-20 .
	Displays the Sweep Setup menu. Refer to “Sweep Menu” on page 3-62 .
	Captures an image of the current display and saves a PNG file to the default location. Files are named based on the measurement type and current date and time. Refer to “Screen Shot Capture” on page 7-1 for additional information.
	Displays the Trace menu. Trace operations include Copy Trace to Memory, Display Trace only, Display Memory only, Display Trace and Memory. Trace math functions include Trace – Memory, Trace + Memory, (Trace + Memory) / 2, or none. Refer to “Trace” on page 3-42 for detailed instructions.

Table 2-1. Site Master Keypad Functions (3 of 3)

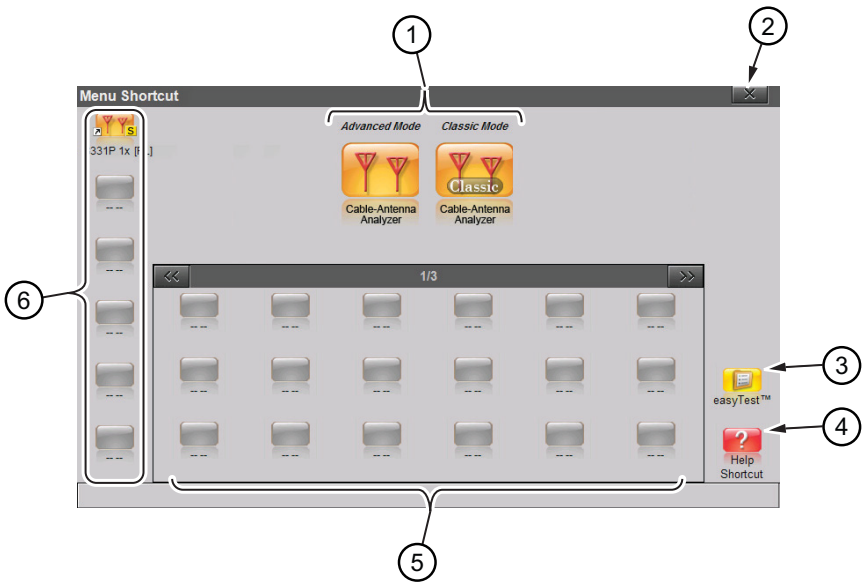
Key	Description
	Displays the Limit menu to set user defined limits. Limit Alarms and Pass/Fail messages may be activated to indicate when a limit has been exceeded by the active measurement. Refer to Chapter 3 for Cable & Antenna mode. Refer to “Limit Menu” on page 4-8 for the Classic mode Limit menu.
	Opens the Save dialog box for quick saving of the current measurement, setup, or screen display. Files can be saved to your tablet or PC local disk or to a removable storage drive. Refer to “Save File” on page 6-2 .
	Opens the System menu and provides access to System Information, System Setups, and Diagnostic tools. Refer to Chapter 7 for additional information.
	Opens the Preset/Reset submenus for resetting the Site Master back to default settings, deleting custom files and user files. Refer to “Preset Menu” on page 7-11 .
	Auto scales the Amplitude axis. Refer to “Amplitude Menu” on page 3-55 .
	Toggles the sweep setup of the active measurement between Run and Hold. Hold retains the last measured value on the display until the unit is placed back into Run mode. Refer to “Sweep Menu” on page 3-62 .
	Exits the Site Master application.

Menu Shortcut Window

Press the **Menu** key on the virtual keypad to open the Menu Shortcut window. From here, you may switch between Cable-Antenna Analyzer Advanced and Classic modes by touching the appropriate mode icon.

The screen also displays any user-created shortcuts, which may include measurement setups or submenu key shortcuts. Shortcuts are added, deleted, and moved as described in the next sections.

Help for the Menu Shortcut window is available by pressing the Help Shortcut icon in the lower-right corner of the display.



1	Installed measurement modes
2	Close box
3	Icon to open easyTest Recall dialog box. Refer to “easyTest Tools” on page 8-2 .
4	Help for Menu screen
5	User-created shortcuts
6	Shortcuts displayed in all menus (not available in Classic Mode)

Figure 2-3. Menu Shortcut Window

Create a Shortcut for a Submenu Key

Press and hold down any submenu key to add a shortcut to the Menu Shortcut window. After a few seconds, the Menu Shortcut screen will be automatically displayed showing the available locations for the shortcut. Select an unused location to store the new shortcut.

Create a Shortcut for a Setup File

Press **File** (1), then the **Recall** submenu key to open the Recall dialog box. Navigate to the setup file for which to create a shortcut, then press and hold the file name until the Menu Shortcut window opens. Touch the location where you wish to place the shortcut icon.

Move or Delete a Shortcut

To move or delete a shortcut, press the **Menu** key, then press and hold the icon until the Customize Shortcut dialog box opens (see [Figure 2-4](#)). Press **NO** to delete. To move, press **Yes**, in which case the shortcut icon will be highlighted in green. Touch the new location where the icon is to be placed. If the location is currently occupied by another shortcut, the two icons will swap positions.

To cancel the operation without moving or deleting, press **Cancel** or the **Close** button of the Customize Shortcut dialog.

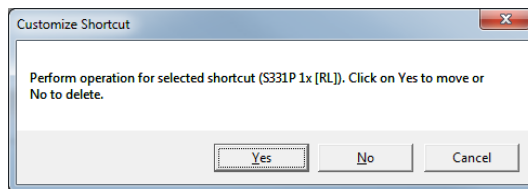


Figure 2-4. Customize Shortcut

After the move or deletion, press **Esc** to close the Menu Shortcut window.

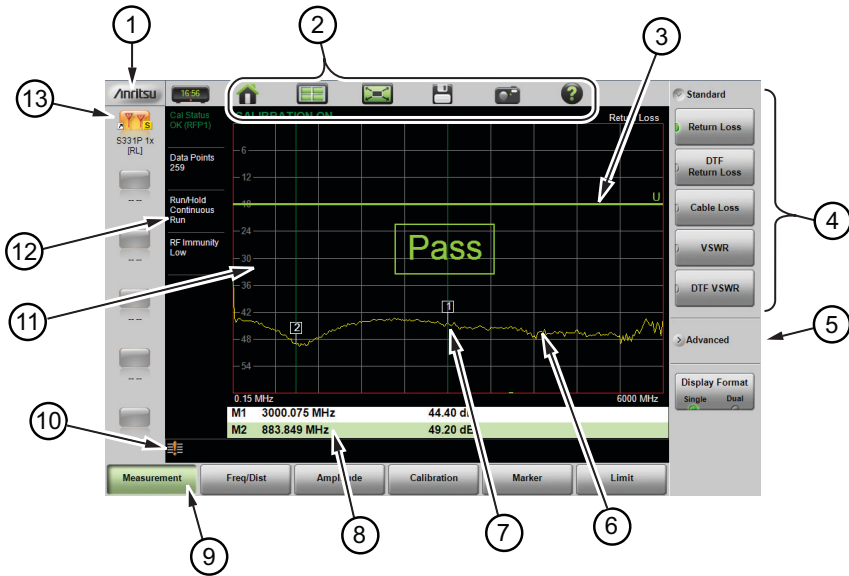
Note

All shortcuts can be deleted at once using the **Preset** > **Reset** submenu. Select **Delete Custom Files**, then select the **Menu Shortcuts** checkbox. Press the **Delete Custom Files** button.

Refer to [“Preset Menu” on page 7-11](#) for additional information.

Function Menus and Tool Bar

Figure 2-5 illustrates the main status and control elements of the Site Master user interface.





1	Anritsu logo. Displays the System Status dialog. Press ESC or  to close. Refer to the “ Status Menu ” on page 7-8 for additional information.
2	System Function Tool Bar. Shortcuts to various system functions. See “ System Function Tool Bar ” on page 2-13 for information on each icon. Not displayed in Classic Mode.
3	User-defined limit line.
4	Expanded submenu. Expanded submenus display the function buttons.
5	Collapsed submenu. Pressing a collapsed submenu title will cause it to expand as shown in row 4. Refer to “ Submenu Keys ”.
6	Active trace sweeping between Start Frequency (F1) and Stop Frequency (F2).
7	Marker 1.

Figure 2-5. Site Master Interface Screen (1 of 2)

8	Marker table. Refer to “Markers” on page 3-36 .
9	Main menu keys with Measurement selected. Refer to “Main Menu Keys” .
10	Warning and status area.
11	Trace window (or graticule), a 10 x 10 grid showing the active trace.
12	Measurement information. Displays current status. May also be used as a shortcut to submenus.
13	User-defined shortcuts. Not available in Classic Mode.

Figure 2-5. Site Master Interface Screen (2 of 2)

Main Menu Keys

These six main menu keys are horizontally arranged along the lower edge of the interface screen. The main menu key functions change with the instrument mode (Advanced or Classic), which is set with the **Menu** key or the Mode Selector icon  (not available in Classic mode). The main menu keys open function-specific submenus.

Submenu Keys

The submenu keys are arranged along the right side of the trace window. Several submenus may be displayed in the submenu block area. Press any collapsed submenu title to expand the submenu and display the submenu keys. Press one of the keys to make a selection or set a parameter.

In **Figure 2-6**, the **Measurement** main menu is selected (Green depressed state) and the Return Loss measurement button is selected (Green indicator).

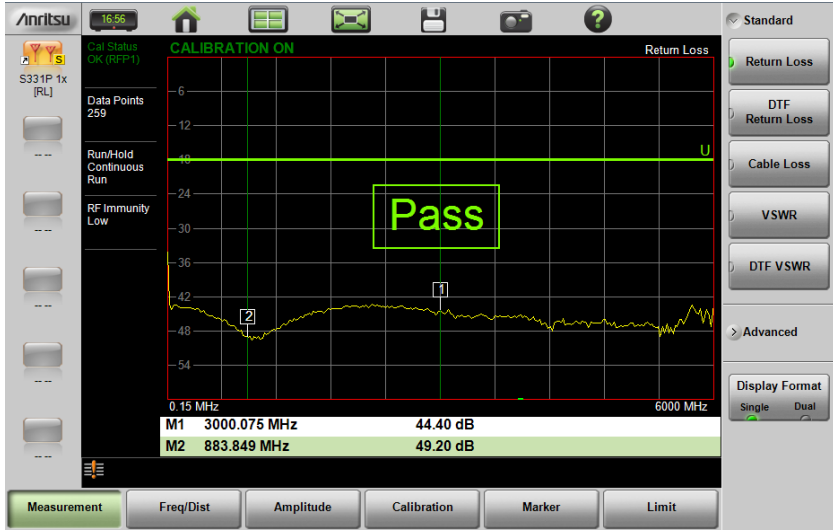


Figure 2-6. Return Loss Measurement

Submenu Key Types

The Site Master interface uses several submenu key types. Each is described in [Table 2-2](#).

Table 2-2. Submenu Key Examples (1 of 2)


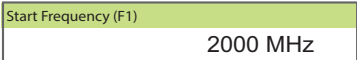
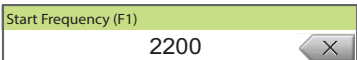




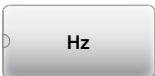


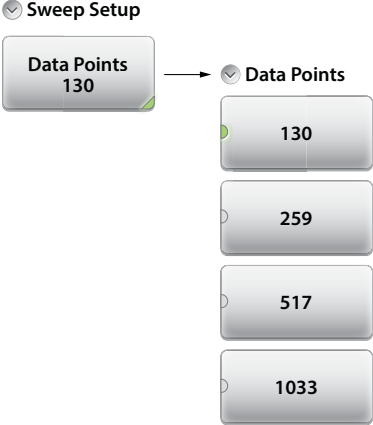
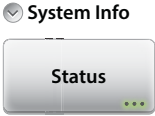

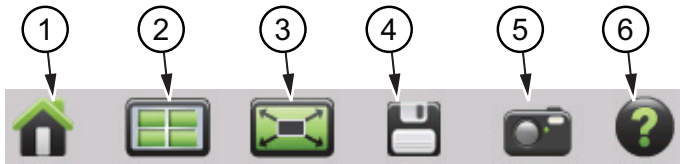
Key Description	Key Example
<p>1. Numeric Entry</p> <p><i>example:</i> Start Frequency (F1) key in the Freq/Dist menu.</p> <p>Opens an edit box where you can enter a value using the numeric keypad (see Figure 3-21 on page 3-26). Press one of the unit keys to apply the value or press ESC to cancel the entry. Press  to delete the last digit entered. Entering a value beyond the range of the instrument will set the parameter to the maximum or minimum value.</p>	  <input checked="" type="radio"/> Frequency  <input checked="" type="radio"/> Units    
<p>2. Toggle</p> <p>Each press of the button cycles between the available settings. The active setting is indicated by the green indicator.</p>	<input checked="" type="radio"/> Calibration 

Table 2-2. Submenu Key Examples (2 of 2)

Key Description	Key Example
<p>3. Menu Selection <i>example:</i> Measurement main menu. This key type is used when multiple options are available. The current choice is indicated by the green indicator at the left of the button.</p>	 <p>The diagram shows a vertical list of four keys. The top key is labeled 'Standard' and has a small green checkmark on its left side, indicating it is the selected option. Below it are three other keys: 'Return Loss', 'DTF Return Loss', and 'DTF VSWR'. A wavy line is drawn between the 'DTF Return Loss' and 'DTF VSWR' keys.</p>
<p>4. Submenu Selection <i>example:</i> Data Points key in the Sweep (3) menu. The current setting is displayed below the key label. Pressing the key opens a submenu of available choices. Press one of the keys to select a new value. Press ESC to exit the submenu without making a change.</p>	 <p>The diagram shows a 'Sweep Setup' menu with a dropdown arrow. The selected option is 'Data Points 130'. An arrow points from this key to a submenu. The submenu contains four keys: 'Data Points 130' (selected with a green indicator), '259', '517', and '1033'.</p>
<p>5. Dialog Dialog buttons are indicated with 3 green dots in the lower-right corner of the key. Pressing this key type will display a list or dialog box. Press ESC to close the dialog or list box.</p>	 <p>The diagram shows a single key labeled 'System Info' with the word 'Status' below it. In the bottom right corner of the key, there are three small green dots, indicating it is a dialog key.</p>
<p>6. Action Pressing an action key triggers the associated function.</p>	 <p>The diagram shows a single key labeled 'Marker Search' with the text 'Marker to Peak' below it.</p>

System Function Tool Bar

The System Function Tool Bar icons allow quick access to functions that are not measurement-specific. [Figure 2-7](#) shows the icons that are displayed in the tool bar area (not available in Classic mode).



1	Preset icon – Opens the Preset (9) Menu. See “Preset Menu” on page 7-11 for additional information.
2	Mode Selector icon – Opens the Mode Selector window, where you can switch between <i>Advanced</i> and <i>Classic</i> Cable-Antenna Analyzer mode. Tap an icon (Figure 2-8 on page 2-14) to change modes or press ESC to cancel.
3	Full Screen icon – Sets the display to full screen mode (hides all of the tool bars, shortcut icons, and menus). Full screen view increases the size of the trace window. Press ESC to return to normal view. Measurement menus are not accessible in Full screen mode, but the AutoScl (.), Run/Hold (+/-), Save (7), and ScrnShot (4) keys are active. Displayed markers can also be moved using the touch screen on your tablet. Refer to Figure 2-9 on page 2-14 for a comparison of the two views.
4	Save icon – Shortcut to open the Save dialog. See “Save File” on page 6-2 for additional information.
5	Camera icon – Captures a screen shot of the current interface display and saves it as a PNG file to the default location on your tablet or PC. The file is named based on the instrument model, measurement type, and current date and time. The ScrnShot (4) key performs the same function. Refer to “Screen Shot Capture” on page 7-1 for examples and details on the image capture options (capture size, background color, and header/footer).
6	Help icon – Shortcut to access the Help (0) feature. See “Help” on page 7-3 for more information.

Figure 2-7. System Function Tool Bar Icons

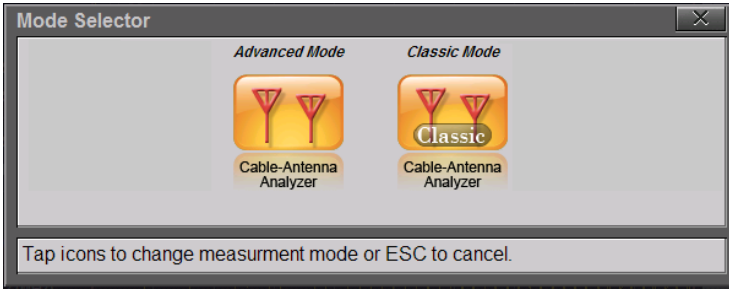
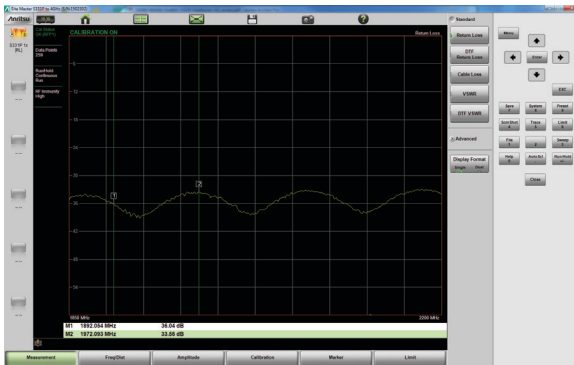
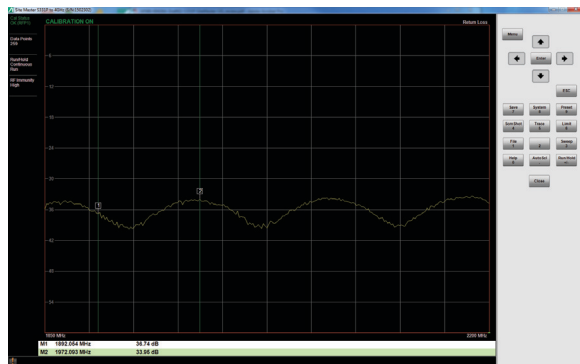


Figure 2-8. Mode Selector Window



Standard View



Full Screen View

Figure 2-9. Comparison of Standard Mode vs. Full Screen Mode

Dual Display Format

The Site Master S331P can display two different measurements simultaneously by setting the Display Format to Dual, then selecting the measurement to display.

Different amplitudes, limit lines, and markers can be set for each display. If the marker table is turned on in dual display mode, the markers for only the active display are shown in the table.

Setting Single or Dual Display

1. Press the **Measurement** main menu key.
2. Toggle the Display Format submenu key so that it is set to Dual.
3. Change the active measurement by tapping directly on the graph. The red outline around the graph indicates the active display.

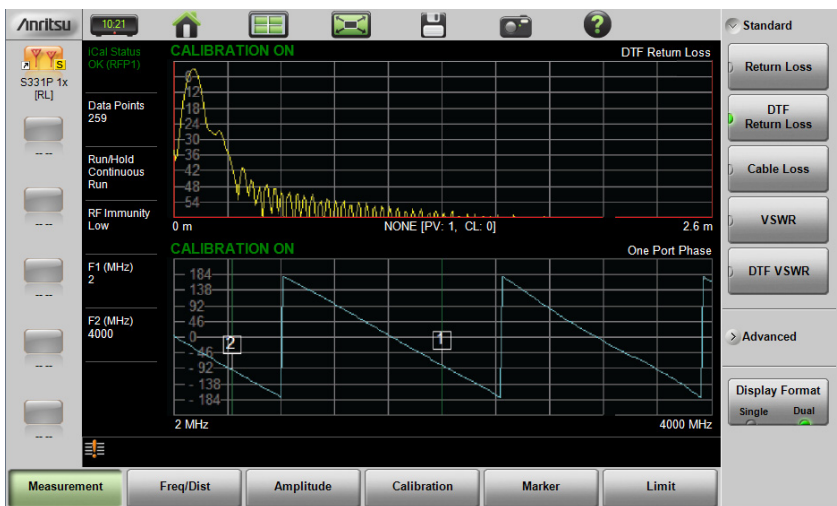


Figure 2-10. Dual Display Format with Top Display Active

Saving Measurements in Dual Display

When saving a file while in dual display mode, both traces are saved in a single measurement file. The default file name will contain references to both trace types, but you can change the name, as with any file. Refer to **“File Name”** on page 6-3.

Display Modes

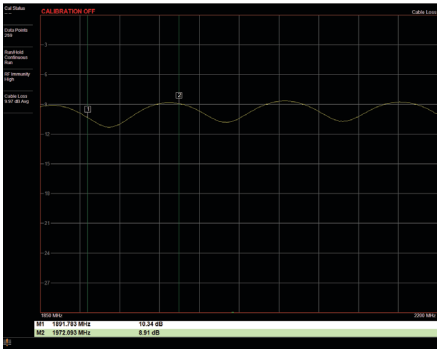
The S331P software offers the following display color schemes:

Standard is the default display mode, suitable for normal lighting conditions.

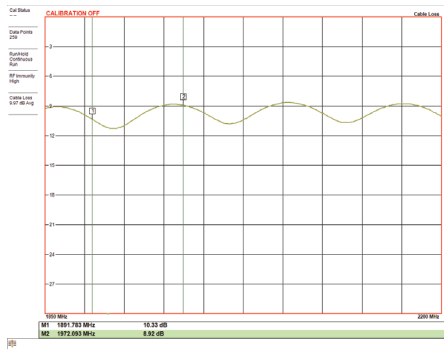
Daytime is used for challenging daytime viewing conditions requiring increased contrast.

Nighttime is optimized for nighttime viewing with a darker, red-tinted color scheme.

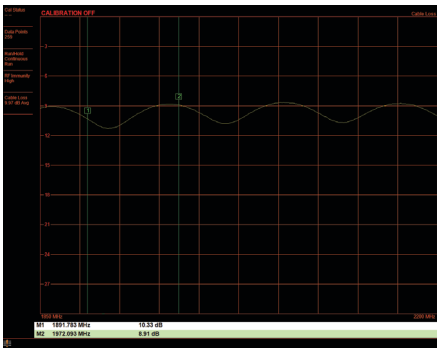
To change the display mode, press **System (8)** > System Setups > Display and select one of the **Color Schemes** from the pull-down menu. Press **Enter** to set or **ESC** to close the Display Settings window without making a change. Refer to [“Display Settings” on page 7-9](#).



Standard



Daytime



Nighttime

Figure 2-11. Site Master Color Schemes

2-5 Calibration Symbols

The following symbols and indicators are displayed in the upper left of the screen to indicate the instrument calibration status and type when in Cable & Antenna Analyzer mode.

iCal Status OK (RFP1) **CALIBRATION ON**

The Site Master has been calibrated for an OSL Reflection (1-port) measurement with a Flex calibration indicating it is possible to change the frequency range after calibration.

Cal Status OK (RFP1) **CALIBRATION ON**

The Site Master has been calibrated for an OSL Reflection (1-port) measurement with a Standard calibration indicating it is not possible to change the frequency range after calibration without performing another calibration.

Cal Status -- -- **CALIBRATION OFF**

The Site Master has not yet been calibrated. Perform a calibration before making measurements.

Cal Status OFF **CALIBRATION OFF**

The Site Master has been calibrated, but Cal Correction is Off. The calibration correction has been turned off by the user or by the recalled setup. Set the Cal Correction to On, or start a new calibration.

Cal Status OFF **CALIBRATION OFF (\uparrow °C)**

The Site Master has been calibrated, however, the instrument temperature has drifted more than ± 20 °C since the last valid calibration was performed. A new calibration is required. For calibration procedures, refer to [Chapter 5](#).

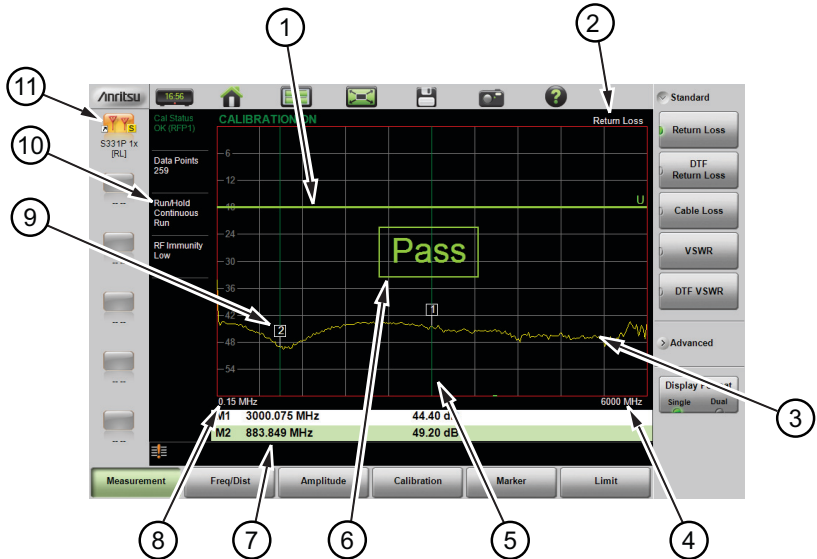
Chapter 3 — Cable and Antenna Measurements

3-1 Overview

This chapter describes Cable and Antenna measurements and how to set up the instrument and perform basic line sweeps.

Note Use the **Menu** key and confirm that the instrument is in Cable & Antenna Analyzer Advanced mode (*not Classic mode*).

Figure 3-1 illustrates a typical Cable and Antenna Return Loss measurement.



1	Limit line (green for Pass, red for Fail)
2	Measurement type
3	Active trace (Yellow)

Figure 3-1. Cable and Antenna Display Overview (1 of 2)

4	Stop frequency (F2)
5	Marker 1 (Marker to Peak)
6	Pass message (active trace is entirely below the upper limit line in Return Loss measurement)
7	Marker table
8	Start frequency
9	Marker 2 (Marker to Valley)
10	Measurement details (also Menu Shortcuts)
11	User-defined setup and menu shortcuts (not available in Classic mode)

Figure 3-1. Cable and Antenna Display Overview (2 of 2)

3-2 Common RF Terms

3 dB rule: A 3 dB gain means twice (x2) the power. A 3 dB loss means half the power. For example, a system with 40 watts of input power and a 6 dB insertion loss will only have 10 watts of output power.

dB: Decibel, a logarithm (equal to 10 times) ratio of the difference between two values. The Site Master uses dB to measure the ratio of sent signal energy to reflected signal energy.

Common values of dB to ratios: 0 dB = 1:1, 10 dB = 10:1, 20 dB = 100:1, 30 dB = 1,000:1, -30 dB = 0.001:1. or (1/1000):1.

dBm: An absolute measurement of power relative to 1 milliwatt. 0 dBm = 1.0 milliwatt, 10 dBm = 10 milliwatt, 30 dBm = (1 mW x 1,000) = 1 watt.

DTF (Distance to Fault): Measures the location and reflection size of impedance mismatches. This is typically a diagnostic measurement, not a pass/fail judgment measurement. DTF is used to identify and locate faults within an antenna system when the system is failing to meet the specified return loss/VSWR limits. DTF is also useful to verify the total length of a coaxial cable assembly.

Impedance: A measure of an RF components electrical resistance. Measured in ohms (Ω). In most cable and antenna systems the standard impedance is 50 Ω .

Insertion Loss (Cable Loss): Measures the total amount of signal energy absorbed (lost) by the cable assembly. Measured in dB. S21 is another name for this measurement. This is often a pass/fail measurement.

Return Loss: Measurement in dB of reflected energy caused by impedance mismatch. May also be referred to as S11. S11 values are expressed as negative numbers, but Return Loss values are expressed as positive numbers since by definition the “Loss” expression implies a negative sign. The higher the value, the better the impedance match (*think of a large negative number being less than a smaller negative number*). 40 dB is nearly ideal. Only 0.01% of the total transmitted power is reflected if the Return Loss measurement value is 40 dB. 0 dB would be a complete reflection, or stated another way, 100% of the transmitted power is reflected back. Return Loss is typically a pass/fail measurement.

RF (Radio Frequency): Frequency of radio sine waves. RF range is 3 kHz to 300 GHz.

VSWR (Voltage Standing Wave Ratio): Another method to measure reflected energy caused by impedance mismatch. Expressed as a ratio of X:1. VSWR measures the voltage peaks and valleys. 1:1 would be a perfect match. A typical cable and antenna system would be around 1.43:1 or 15 dB Return Loss. The Site Master can measure either Return Loss or VSWR. Some carriers require that Return Loss is measured in VSWR. This is typically a pass/fail measurement.

Watt: Unit of measure for power.

3-3 Overview

Line Sweeping

System performance issues are seen in two ways: excessive reflections (more common) caused by impedance mismatches or excessive insertion losses (less common) caused by energy dissipated in the connectors or cables.

The two measurements used to determine communication system performance are:

- Return Loss or Standing Wave Ratio (SWR) for reflections and
- Cable Loss (Insertion Loss) for insertion losses.

It is important to remember that Return Loss and VSWR are typically Pass/Fail tests. They both measure reflection but display the results in different ways. For either measurement, set a limit line to the specification determined by the carrier and make the measurement.

If the *entire* frequency range swept is below the line, the test passes. If *any* part of the sweep is at or above the limit line, the test fails.

With a failed test, one or more components is at fault. Distance to Fault mode is used to find the problem. [Figure 3-2](#) shows a failed Return Loss measurement with the pass/fail limit line and [Figure 3-3 on page 3-5](#) is a Distance to Fault measurement of the same system.

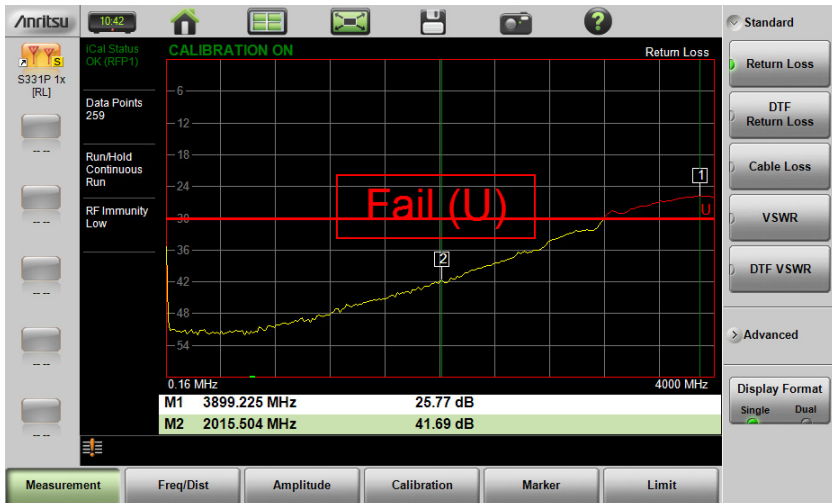
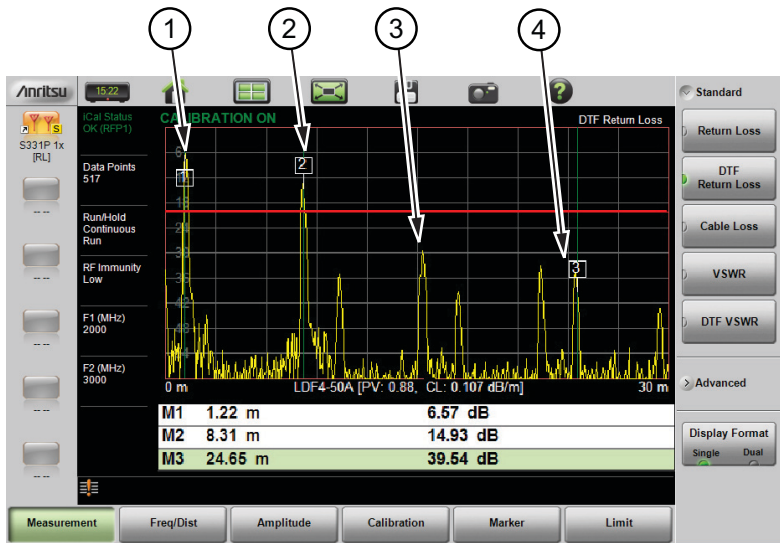


Figure 3-2. Failed Return Loss Measurement



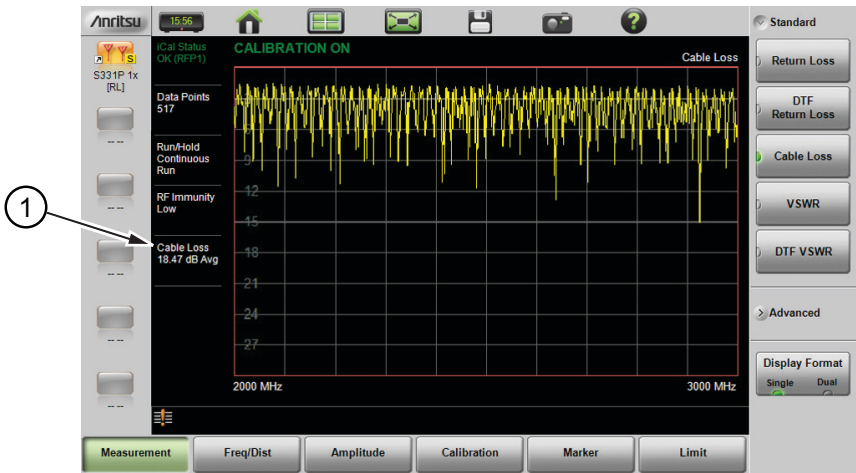
- 1 Failure at Jumper (1.22 m)
- 2 Possible Failure at 8.31 m
- 3 Example of Good Connector (~30 dB)
- 4 Precision Load Connected at End of Cable (24.65 m)

Figure 3-3. Distance to Fault Measurement Shows the Failing Components

The second common Line Sweeping measurement is Cable Loss (Figure 3-4 on page 3-6). This is a measure of how much smaller the output power of a signal is compared to the input power. The loss comes from heat and leakage. Cable manufacturers will specify the loss per foot or meter at different frequencies and may call it attenuation. The Site Master has pre-installed loss specifications for several cable types.

The Cable Loss measurement is also typically a Pass/Fail measurement and requires a short or open at the cable end. This is a typical measurement specified on new installations or main transmission line replacement but is not typically tested on existing systems.

Note Cable Loss cannot be measured with an antenna connected.



1 Average Cable Loss

Figure 3-4. Cable Loss Measurement

Calibration

For accurate results, the instrument must be calibrated before making any measurements.

The Cable and Antenna Analyzer mode requires calibration standards for OPEN, SHORT, and LOAD (OSL), which are sold separately.

The instrument must be re-calibrated whenever the temperature exceeds the calibration temperature range or when the test port extension cable is removed or replaced. Unless the calibration type is Flex, the instrument must also be re-calibrated every time the setup frequency changes. Refer to [Chapter 5](#) for details on how to perform a calibration.

Note

Anritsu recommends allowing the S331P to warm up for 5 minutes to typical operation temperature before calibrating. The instrument will require a new OSL calibration if the internal instrument temperature changes more than 20 °C after calibration.

3-4 Line Sweep Measurements

To verify the performance of the transmission feed line system and analyze typical problems, three types of line sweeps can be performed:

- Return Loss
- Cable Loss
- Distance-To-Fault

Note

Anritsu recommends using a phase-stable test port cable, attached to the Site Master RF port. Calibrate at the open end of the cable.

Return Loss/VSWR Measurement

This is a measurement made when the antenna is connected at the end of the transmission line. It provides an analysis of how the various components of the system are interacting.

Return Loss measures the reflected power of the system in decibels (dB). This measurement can also be taken in the Standing Wave Ratio (SWR) mode, which is the ratio of voltage peaks to voltage valleys caused by reflections.

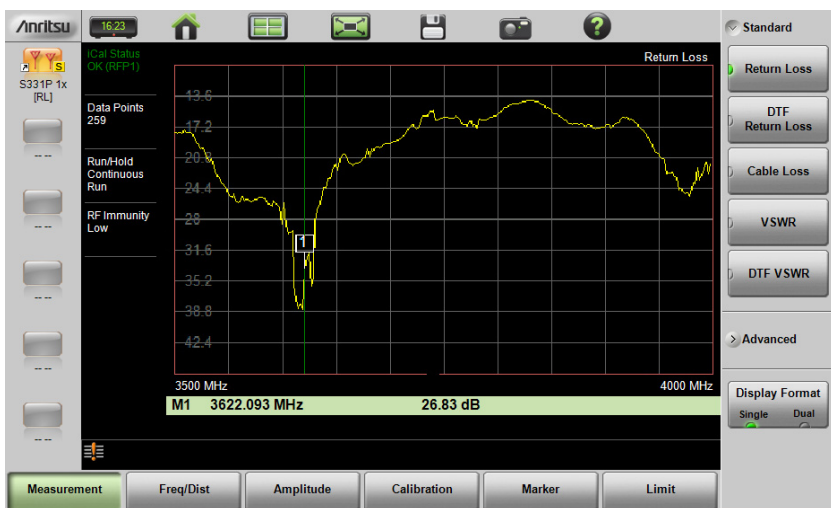


Figure 3-5. Antenna Return Loss Trace

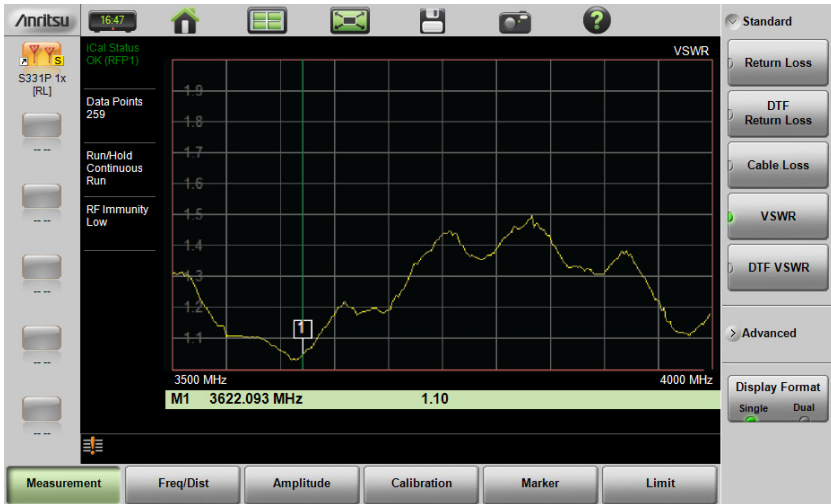


Figure 3-6. Same Antenna Trace in VSWR

The following describes the main steps to follow when making Return Loss or VSWR measurements. For details on how to enter or select parameter settings, refer to each parameter description under.

1. Press the **Measurement** main menu key and select **Return Loss** or **VSWR**.
2. Press **Freq/Dist** and enter the start and stop frequencies.
3. Press **Amplitude**, then enter the top and bottom power levels for the display or press **Fullscale**.
4. Press the **Calibration** main menu key and perform a calibration of the instrument. Anritsu suggests using a phase-stable test port cable. Refer to [Chapter 5](#) for details.
5. Connect the Site Master to the Device Under Test using the calibrated phase-stable test port cable.
6. Press the **Marker** main menu key and set the appropriate markers as described in [“Markers” on page 3-36](#).
7. Press the **Limit** main menu key and set the limit lines as described in [“Limit Lines” on page 3-30](#).
8. Press **Save** (7), then **Save** to save the measurement data to file. Refer to [“Save File” on page 6-2](#) for details on setting the save location.

Cable Loss Measurement

Cable loss sweep is made when a short is connected at the end of the transmission line. This insertion loss test allows analysis of the signal loss through the transmission line and identifies problems in the system. High insertion loss in the feed line or jumpers can contribute to poor system performance and loss of coverage.

Different transmission lines have different losses, depending on frequency and distance. The higher the frequency or longer the distance, the greater the loss. This measurement returns the energy absorbed, or lost, by the transmission line in dB/meter or dB/ft. The average cable loss of the frequency range is displayed on the screen in the measurement settings summary area.

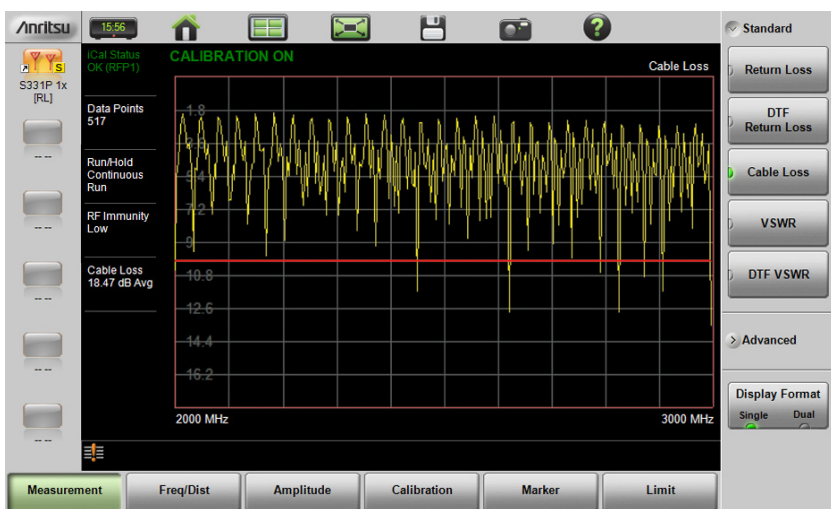


Figure 3-7. Cable Loss Measurement

The following describes the main steps to follow when making Cable Loss measurements. For details on how to enter or select parameter settings, refer to each parameter description under.

1. Press the **Measurement** main menu key and select **Cable Loss**.
2. Press **Freq/Dist** and enter the start and stop frequencies.
3. Press **Amplitude**, then enter the top and bottom power levels for the display or press **Fullscale**.

4. Press the **Calibration** main menu key and perform a calibration of the instrument. Anritsu suggests using a phase-stable test port cable. Refer to [Chapter 5](#) for details.
5. Connect the Site Master to the Device Under Test using the calibrated phase-stable test port cable.
6. Press the **Limit** main menu key and set the limit line as described in [“Limit Lines” on page 3-30](#). This limit line is used only for visual reference and not a pass/fail guide. The pass/fail determination is based on the average cable loss.
7. Press **Save** (7), then **Save** to save the measurement data to file. Refer to [“Save File” on page 6-2](#) for details on setting the save location.

DTF Measurement

Distance-To-Fault (DTF) measurements are made with the antenna disconnected and replaced with a 50 Ω precision load at the end of the transmission line. This measurement allows analysis of the various components of the transmission feed line system in the DTF mode.

This measurement reveals the precise fault location of components in the transmission line system. This test helps to identify specific problems in the system, such as connector transitions, jumpers, kinks in the cable or moisture intrusion.

The first step is to measure the distance of a cable. This measurement can be made with an open or a short connected at the end of the cable. The peak indicating the end of the cable should be between 0 dB and 5 dB. An open or short should not be used when DTF is used for troubleshooting the system because the open/short will reflect most of the RF energy from the Site Master and the true value of a connector might be misinterpreted or a good connector may look like a failing connector.

A 50 Ω load is the best termination for troubleshooting DTF problems because it will be 50 Ω over the entire frequency range. The antenna can also be used as a terminating device, but the impedance of the antenna will change over different frequencies since the antenna is typically only designed to have 15 dB or better return loss in the passband of the antenna.

DTF measurement is a frequency domain measurement and the data is transformed to the time domain. The distance information is obtained by analyzing how much the phase is changing when the system is swept in the frequency domain. Frequency selective devices such as TMAs (Tower Mounted Amplifiers), duplexers, filters, and quarter wave lightning arrestors change the phase information (distance information) if they are not swept over the correct frequencies. Care needs to be taken when setting up the frequency range whenever a TMA is present in the path.

DTF Aid

Because of the nature of the measurement, maximum distance range and distance resolution are dependent upon the frequency range and number of data points. DTF Aid (**Freq/Distance** > Distance > DTF Aid) shown in Figure 3-8 explains how the parameters are related.

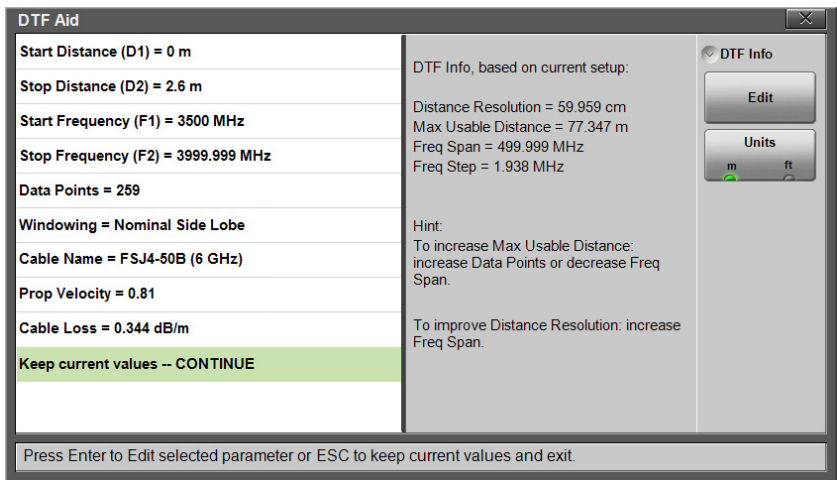


Figure 3-8. DTF Aid

3-4 Line Sweep Measurements Cable and Antenna Measurements

If the cable is longer than DMax, the only way to improve the horizontal range is to reduce the frequency span or to increase the number of data points. Similarly, the distance resolution is inversely proportional to the frequency range and the only way to improve the distance resolution is to widen the frequency span.

Note

When determining the frequency range, consider all in-line frequency selective devices.

Cable List

Selecting the cable type is critical for accurate DTF measurements. Incorrect propagation velocity values affect the distance accuracy, and inaccurate cable attenuation values affect the accuracy of the amplitude values. The Site Master S331P is equipped with a cable list (**Freq/Dist > DTF Setup > Cable List**) including most of the common cables currently used. Once the correct cable has been selected, the instrument will update the propagation velocity and the cable attenuation values to correspond with the cable. For setups with several different cable types, choose the main feeder cable.

For cables not on the list, select **NONE** and manually enter the Prop Velocity and Cable Loss in DTF Aid or the DTF Setup submenu.

Custom Cables can be created and uploaded to the instrument using Line Sweep Tools (LST). Instructions for using the LST Cable Editor are available in the software Help menu.

The name, propagation velocity, and cable loss of the selected cable are displayed below the trace window during distance measurements (**Measurement > DTF Return Loss** or **DTF VSWR**) as shown in [Figure 3-9](#).

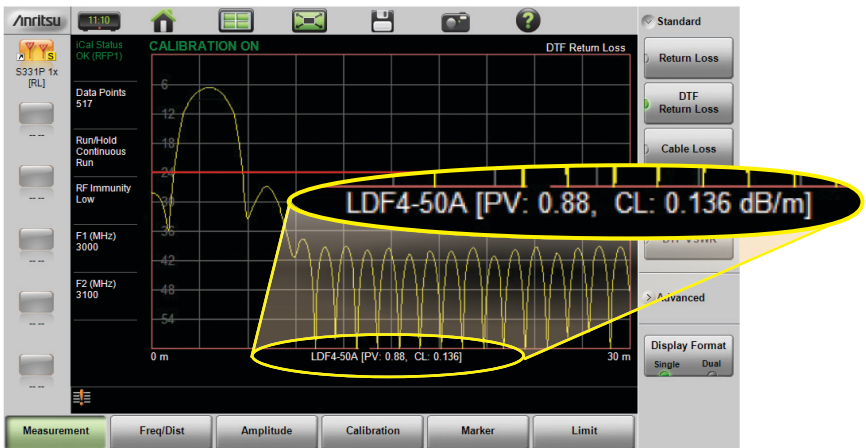
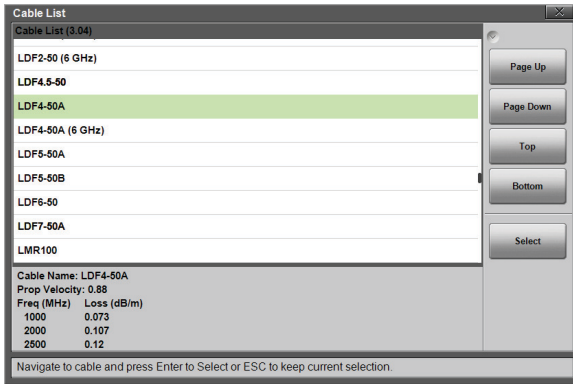


Figure 3-9. Cable List Selection

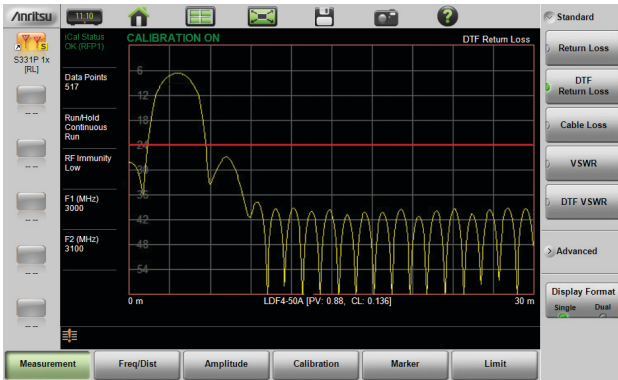
Distance Resolution

Distance resolution is the Site Master’s ability to separate two closely spaced discontinuities. If the resolution is 5 meters and there are two faults 3 meters apart, the Site Master will not be able to show both faults until the resolution is improved by widening the frequency span.

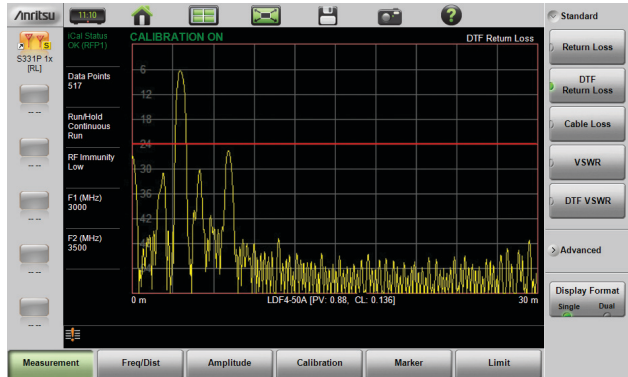
$$\text{Distance Resolution (m)} = 300 \times \text{pv} / \Delta F \text{ (MHz)}$$

3-4 Line Sweep Measurements Cable and Antenna Measurements

Figure 3-10 is an example of the same DTF measurement with a 100 MHz span vs. a 500 MHz span. The increased span provides additional detail that there may be several unique issues with the first 10 meters of the cable. This detail was not available in the narrower span.



100 MHz Span



500 MHz Span

Figure 3-10. DTF Measurements at 100 MHz vs. 500 MHz

Windowing

The theoretical requirement for inverse FFT is for the data to extend from zero frequency to infinity. Side lobes appear around a discontinuity because the spectrum is cut off at a finite frequency. Windowing reduces the side lobes by smoothing out the sharp transitions at the beginning and end of the frequency sweep. The main lobe widens as the side lobes are reduced, thus reducing the resolution.

In situations where a small discontinuity may be close to a large one, side lobe reduction windowing helps to reveal the discrete discontinuities. If distance resolution is critical, then reduce the windowing for greater signal resolution.

If two or more signals are very close to each other, then spectral resolution is important. In this case, use **Rectangular Windowing** for the sharpest main lobe (the best resolution).

To select the windowing type, follow this key sequence:

Freq/Dist > Distance > DTF Aid > Windowing > Edit

- **Rectangular** windowing provides best spatial distance resolution for revealing closely spaced events, but the side lobes close to any major event (large reflection) may mask smaller events which are close to the major event. Excellent choice if multiple faults of similar amplitudes close together are suspected.
- **Nominal Side Lobe** windowing provides very good suppression of close-in side lobes, but compromises spatial distance resolution compared to Rectangular. Closely spaced events may appear as a single event, often non-symmetrical in shape. Excellent overall choice for most typical antenna system sweeps.
- **Low Side Lobe** windowing provides excellent suppression of close-in side lobes, but spatial distance resolution is worse than Nominal Side Lobe. The additional suppression of side lobes may be useful in locating very small reflection events further away from large events. *It is not often used for field measurements.*
- **Minimum Side Lobe** windowing provides highest suppression of side lobes but worst spatial distance resolution. Can be useful for finding extremely small events spaced further apart than the distance resolution. *Again, not typically used for field measurements.*

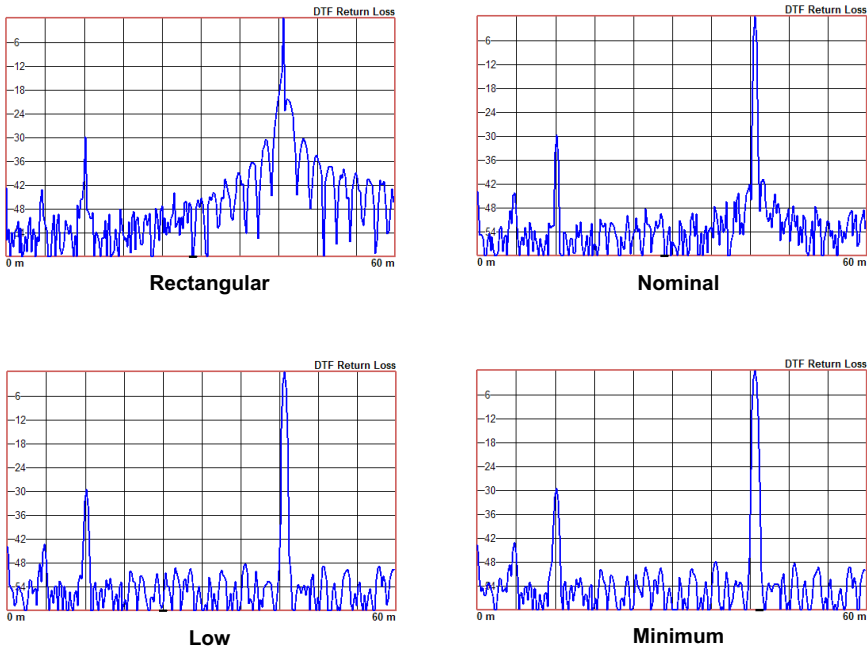


Figure 3-11. Effects of Windowing on a Sample Trace

DMax (Maximum Usable Distance)

DMax is the maximum horizontal distance that can be analyzed. The Stop Distance cannot exceed DMax. If the cable is longer than DMax, DMax needs to be improved by increasing the number of data points or lowering the frequency span (ΔF). Note that the data points can be set to 130, 259, 517, 1033, or 2065 (**Sweep** > Data Points).

$$DMax = (\text{Datapoints} - 1) \times \text{Distance Resolution}$$

The following describes the main steps to follow when making DTF Return Loss or DTF VSWR measurements. For details on how to enter or select parameter settings, refer to each parameter description under.

1. Press the **Measurement** main menu key and select DTF Return Loss or DTF VSWR.
2. Press the **Freq/Dist** main menu key.

3. Press the **Distance** key if the menu is collapsed, then touch **DTF Aid**.
 - a. Touch to select a parameter in the **DTF Aid** table, then press **Edit** to display available selections or, for numeric settings, open the parameter edit box.
 - b. Press the desired setting key to select. If the parameter is a numeric value to be entered, use the virtual keypad to change the value in the edit box. Press **Enter** to apply the setting, **Esc** to exit without making a change. Some parameters may have unit keys for you to select.
 - c. Repeat the steps above to edit more parameters. When done, press **Edit** to close the **DTF Aid** window.

Note	If Stop Distance is greater than DMax , increase the number of data points.
-------------	---

4. Connect a phase-stable test port cable to the Site Master. Press the **Calibration** main menu key and perform a calibration of the instrument. Refer to [Chapter 5](#) for details.
5. Connect the Site Master to the Device Under Test using the calibrated phase-stable test port cable.

Example 1 – DTF with a Short to Measure Cable Length

To measure the length of a cable, DTF measurements can be made with an open or a short connected at the end of the cable. The peak indicating the end of the cable should be between 0 dB and 5 dB. In [Figure 3-12 on page 3-18](#), the cable end is at 20.5 meters.

The cable end was found by selecting Marker 3 (**Marker > Select M(1-8) > M3**) then using searching for the trace peak (**Marker > Marker Search > Marker to Peak**).

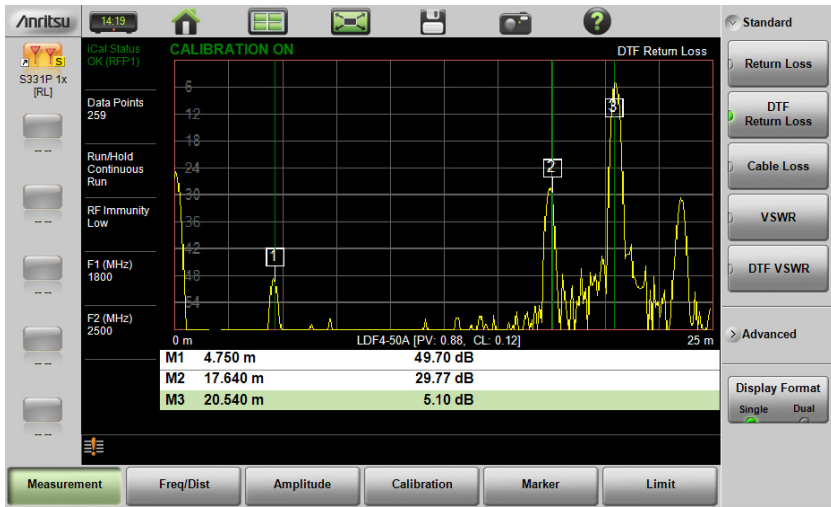


Figure 3-12. DTF Return Loss with a Short at the End of the Cable (20.5 m)

Note In [Figure 3-12](#), M1 and M2 are jumper cable connections. The peak beyond the end of the cable at M3 is the return reflection of the M2 peak.

Example 2 – DTF Transmission Line Test

The Distance-To-Fault transmission line test verifies the performance of the transmission line assembly and its components and identifies the fault locations in the transmission line system. This test determines the return loss value of each connector pair, cable component and cable to identify the problem location. This test can be performed in the DTF Return Loss or DTF VSWR mode. Typically, for field applications, the DTF Return Loss mode is used. [Figure 3-13 on page 3-19](#) shows the failure with the antenna still attached.

To perform this test, disconnect the antenna and connect the load at the end of the transmission line ([Figure 3-14 on page 3-19](#)).



Figure 3-13. DTF Return Loss Measurement (Antenna at 20.54 m)



Figure 3-14. Failing DTF Return Loss Measurement (Load at 20.54 m)

3-4 Line Sweep Measurements Cable and Antenna Measurements

The jumper connector at 17.6 m was found to be loose and dirty. After cleaning and tightening to specification, another DTF measurement showed that the connector now passed the carrier 25 dB specification, indicated by the limit line (Figure 3-15).

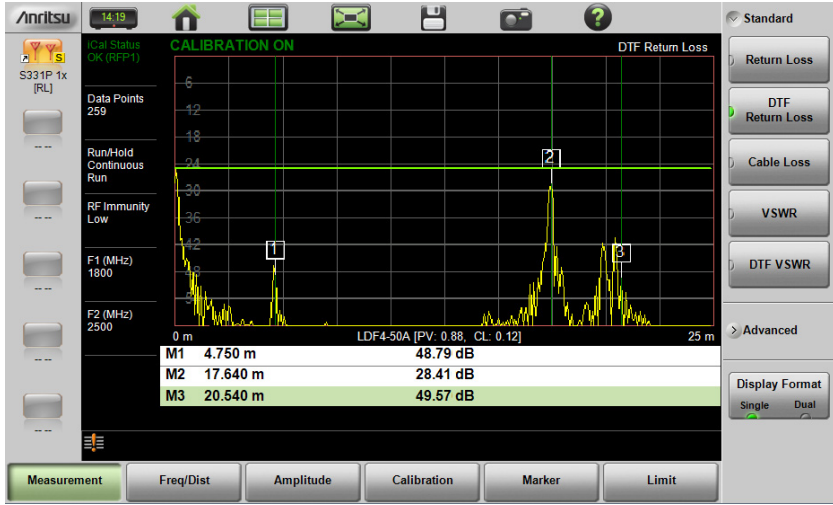


Figure 3-15. Passing DTF Return Loss Measurement (Load at 20.54 m)

Cable and Antenna Measurements 3-4 Line Sweep Measurements

Figure 3-16 shows the same system with the antenna re-attached. The reflection of the jumper connector is now reduced to 27.64 dB.

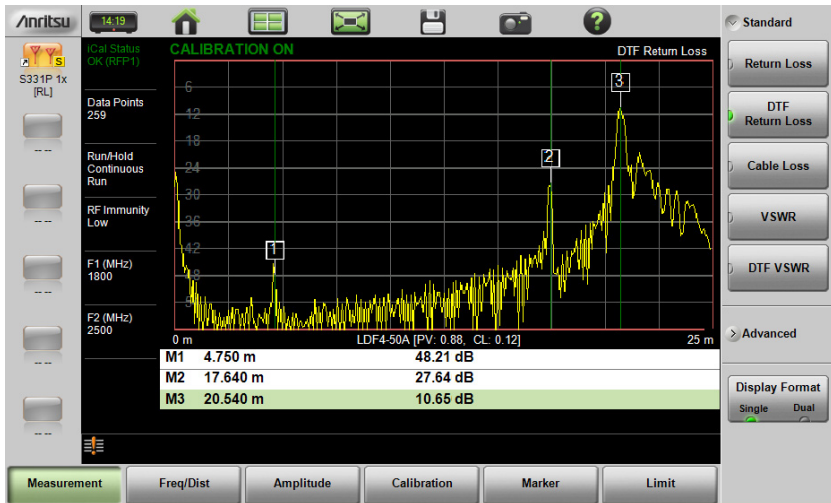


Figure 3-16. DTF Return Loss Measurement (Antenna at 20.54 m)

3-5 Advanced Measurements

Smith Chart

The Smith Chart is a graphical tool for plotting impedance data versus frequency. It converts the measured reflection coefficient data into impedance data and displays it in a manner that makes the Smith Chart a useful tool for determining and tuning input match. Markers can be used to read the real and imaginary parts of the complex impedance. See the example in [Figure 3-17](#). This impedance plot reveals which matching elements (capacitance, inductance) are necessary to match a device under test to the reference impedance, which can be set to either 50 ohms or 75 ohms. See [Figure 3-18](#) and refer to “[Amplitude Menu](#)” on page 3-55.

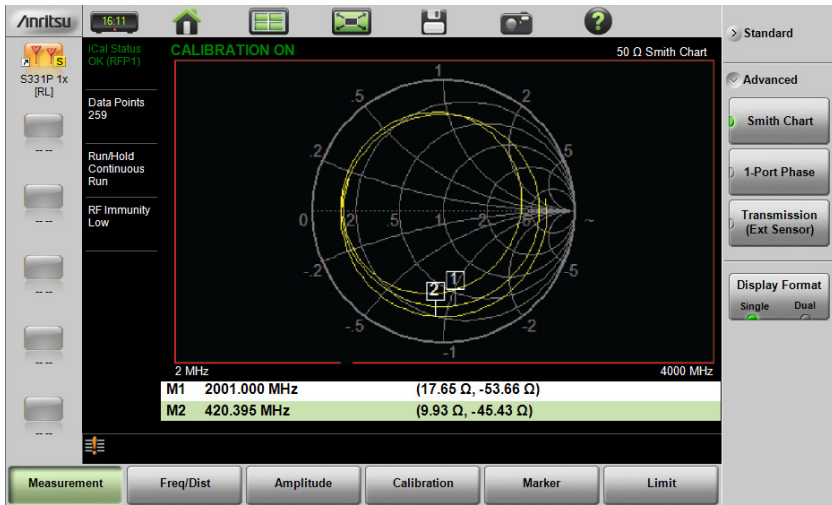


Figure 3-17. Smith Chart Measurement

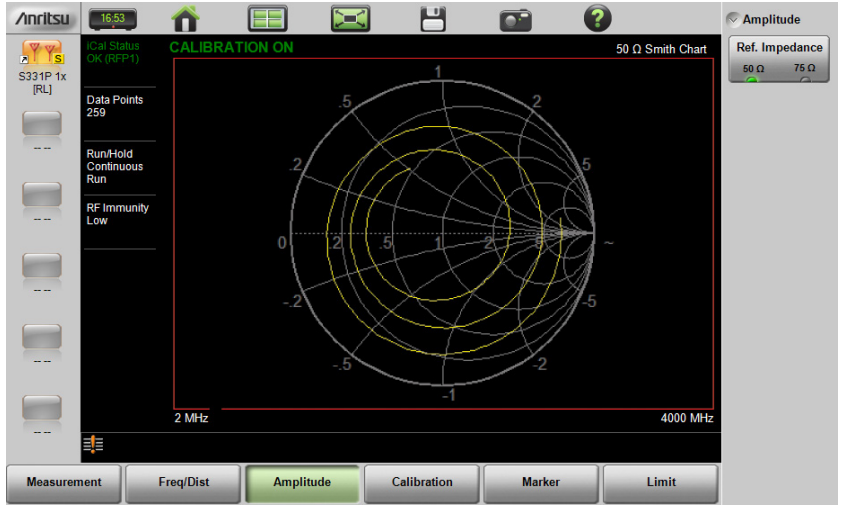


Figure 3-18. Set Reference Impedance for Smith Chart Calculations

1-Port Phase

The S331P can display the phase of the reflection measurements at the RF port. The Phase display range is from -450 degrees to $+450$ degrees.

The 1-port phase measurement is most useful when making relative measurements (comparing the phase of one device to the phase of another) by utilizing the Trace Math function (Trace – Memory).

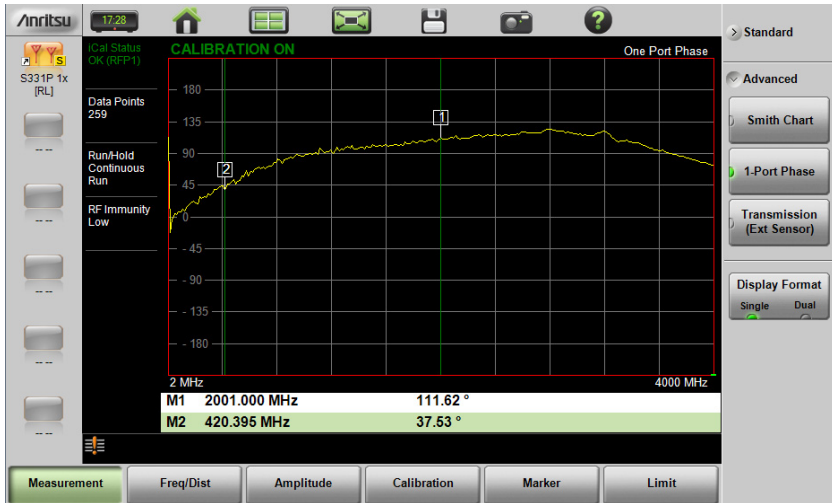


Figure 3-19. 1-Port Phase Measurement

Transmission (Ext. Sensor)

To make more accurate cable loss measurements, especially for cables with more than 10 dB of loss, you can use the Transmission measurement with External Sensor. For this measurement, connect the cable under test to the RF port of the S331P and connect a USB power sensor to the other end of the cable. USB extenders can be used for long cable runs. This measurement gives accurate results of cable loss up to 30 dB. This is a scalar measurement, providing only magnitude data (no phase) and, therefore, does not use vector error correction for its calibration steps. Instead, it uses a sensor reference calibration.

[Figure 3-20](#) is a cable loss measurement example with an external sensor transmission.

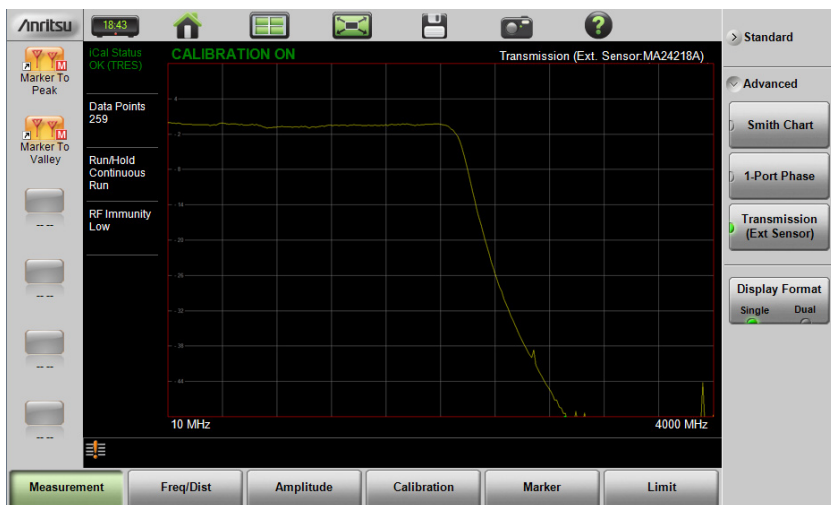


Figure 3-20. External Sensor Transmission Measurement

For best results when performing both transmission and return loss measurements on the same cable, the return loss should be measured with a good-quality termination at the end of the cable.

Note

For a list of external USB sensors that are supported by the S331P for transmission measurements, see the S331P Technical Data Sheet.

3-6 Measurement Setup

This section describes how to set up the Cable and Antenna parameters, markers, and limit lines. Instructions are based on the assumption you are using a tablet to control and operate the Site Master.

Frequency

1. Press **Freq/Dist**, then press Frequency if the menu is collapsed.
2. Press the **Start Frequency** submenu key and use the virtual keypad to enter the value in the edit box. See [Figure 3-21](#).
3. Press one of the unit keys (GHz, MHz, kHz, or Hz) to apply the new value and close the edit box.

To exit without making a change, press **Esc** to cancel the entry, and **Esc** again to close the edit box.

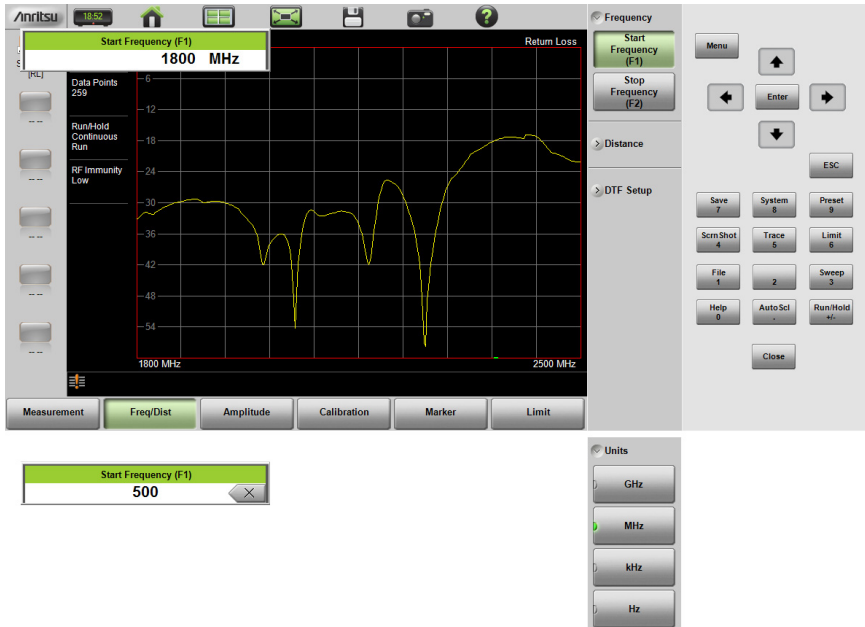


Figure 3-21. Entering Frequency Setting

4. Press the **Stop Frequency** submenu key and use the keypad to enter the value in the edit box, then press one of the unit keys to apply.

Distance

1. Press the **Freq/Dist** main menu key, then press Distance if the menu is collapsed.
2. Press the **Units** key if needed to select the measurement system, foot or metric.
3. Press the **Start Distance** submenu key and use the virtual keypad to enter the value in the edit box.
4. Press one of the unit keys as appropriate to apply the entered value and close the edit box.

To exit without making a change, press **Esc** to cancel the entry, and **Esc** again to close the edit box.

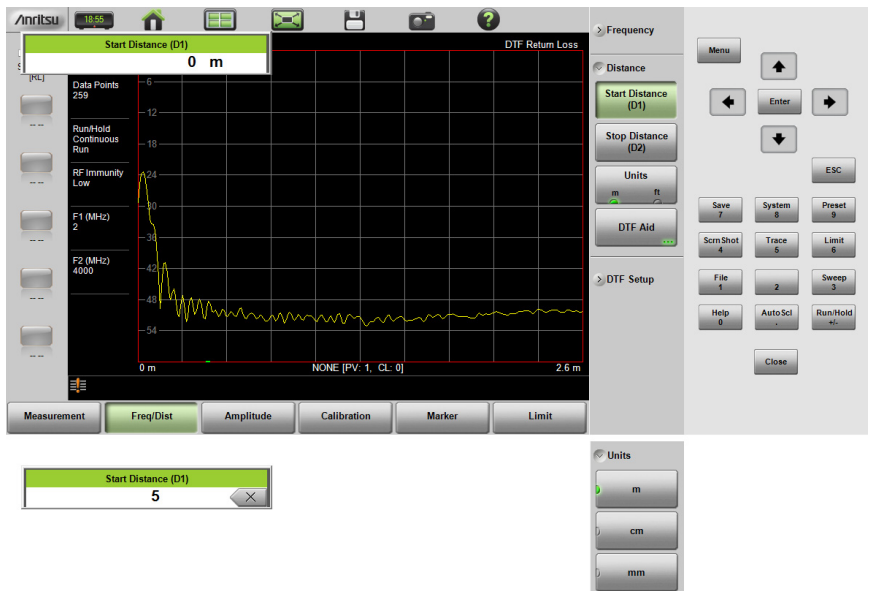


Figure 3-22. Entering Distance Setting

5. Press the **Stop Distance** submenu key and use the keypad to enter the value in the edit box, then press one of the unit keys to apply.
6. To access and change other DTF parameters, press the **DTF Aid** key, then select a parameter in the table and press **Edit**.

Many of the same parameters are available under the **DTF Setup** submenu. Refer to [“DTF Measurement” on page 3-10](#).

Amplitude

Setting the Amplitude using Top and Bottom Keys

To manually set the amplitude scale of the measurement display:

1. Press the **Amplitude** main menu key.
2. Press the **Top** submenu key and use the virtual keypad to enter the value in the edit box.
3. Press the **dB** key or **Enter** to apply the new power level and close the edit box.

To exit without making a change, press **Esc** to cancel the entry, and **Esc** again to close the edit box.

4. Press the **Bottom** submenu key and use the keypad to enter the value in the edit box, then press the **dB** key or **Enter** to apply.

Setting the Amplitude using Autoscale

With Autoscale, the instrument will automatically set the top and bottom scales to display the current measurement.

1. Press the **Amplitude** main menu key
2. Press the **Autoscale** submenu key

Setting the Amplitude using Fullscale

With Fullscale, the instrument will automatically set the top and bottom scales to the default values based on the measurement type.

1. Press the **Amplitude** main menu key.
2. Press the **Fullscale** submenu key.

Refer to [“Amplitude Menu” on page 3-55](#) for additional information.

Sweep

The Sweep Setup menu includes keys to set Data Points, Run/Hold, Sweep Type, and RF Immunity.

Data Points

The number of data points can be set to 130, 259, 517, 1033, or 2065 data points. This can be changed before or after calibration, with one exception (see **Note** below). The default setting is 259. This is recommended for most measurements. Additional data points slow down the sweep speed but are helpful in DTF, as it enables increased distance coverage for the same distance resolution.

1. Press the **Sweep** (3) key, then press Data Points.
2. Select 130, 259, 517, 1033, or 2065 data points.

Refer to “[Sweep Menu](#)” on page 3-62 for additional information about the Sweep Setup menu and submenus.

Note

Setting Data Points to 2065 will invalidate an active Standard Cal correction that was performed with a lower number of data points. A new calibration is recommended before making measurements.

Run/Hold

This key is used to start and stop line sweeping. When the sweep type is set to single mode, this key triggers a single sweep.

1. Press the **Sweep** (3) key.
2. Press Run/Hold to start or stop the line sweep.

Sweep Type

Use this key to toggle between single and continuous sweep mode. In single sweep mode, each sweep is initiated with the Run/Hold key.

1. Press the **Sweep** (3) key.
2. Press Sweep Type to switch between Single and Continuous.

RF Immunity

The RF Immunity setting provides a way to protect the instrument from stray signals generated by nearby or co-located transmitters that can affect frequency and DTF measurements. Interfering signals can make the measurement look better or worse than it is. To improve the instrument’s ability to reject unwanted signals, you can set the RF Immunity to High. However, sweep speed may be slowed as a result.

The Immunity default setting is Low, which makes the instrument more susceptible to interfering signals during a Return Loss or VSWR measurement, but optimizes sweep speed. This is appropriate when the instrument is used in an environment where RF noise is not of great concern.

1. Press the **Sweep** (3) menu key.
2. Toggle RF Immunity between High and Low.

Limit Lines

Limit lines are used for visual reference or for pass/fail criteria using the limit alarm and pass/fail message settings. Pressing either the **Limit** (6) key or the **Limit** main menu key displays the Limit menu.

Overview of limit lines:

- Each measurement has a unique limit line.
- The color of the limit line changes to red when a measurement trace exceeds a limit.
- Limits set beyond the current amplitude range are displayed at either the top or bottom of the graticule.
- The limit line amplitude is stored when a limit line is turned off.
- Limit Preset will turn off the limit line display, limit alarm and Pass/Fail message, and reset upper and lower limits to their default values.

Limit Line Functions

1. Press **Limit** (6), then press the **Active Limit** key (if necessary) to choose Upper or Lower.
2. Press the **Limit State** key, then press **Single** or **Segmented** to turn on a measurement-specific limit line.

A single limit line extends over the entire displayed range of the sweep, independent of the start/stop settings of the sweep. For a single limit line, the amplitude for the start/stop points is the same. A segmented limit line can be divided into connected or disconnected segments with different start/stop x and y values.

Note	Both the upper and lower limit lines for a trace must be of the same type, either single or segmented.
-------------	--

3. Press **Move Active Limit** and use the virtual keypad to enter an amplitude value in the edit box.
4. Press the **dB** key or **Enter** to apply the new power level and close the edit box.

Note	Limit lines cannot be moved by using the touch screen on your tablet.
-------------	---

5. For segmented limit lines, press **Edit Segments** to display the Segments menu. A table displays active limit line segments.
6. Tap on a limit line segment, then choose to **Add**, **Edit**, or **Delete** the segment. For editing purposes, consider a single, full-span limit line as a single segment. Press the **Close** submenu key or the **ESC** key to close the Segments submenu and return to the Limit menu.

Upper limit lines and segments are labeled with a “U”, and Lower lines and segments are labeled with an “L”. Limit lines are displayed in green so long as the limits are not reached or exceeded. When a limit is exceeded (upper or lower), the limit line or segment turns red (Figure 3-23). Any portion of the measurement trace touching or exceeding a limit also turns red, while portions of the trace within limits remain in the default yellow color. When Segmented Limits are used, the trace color does not change if the limits are exceeded.

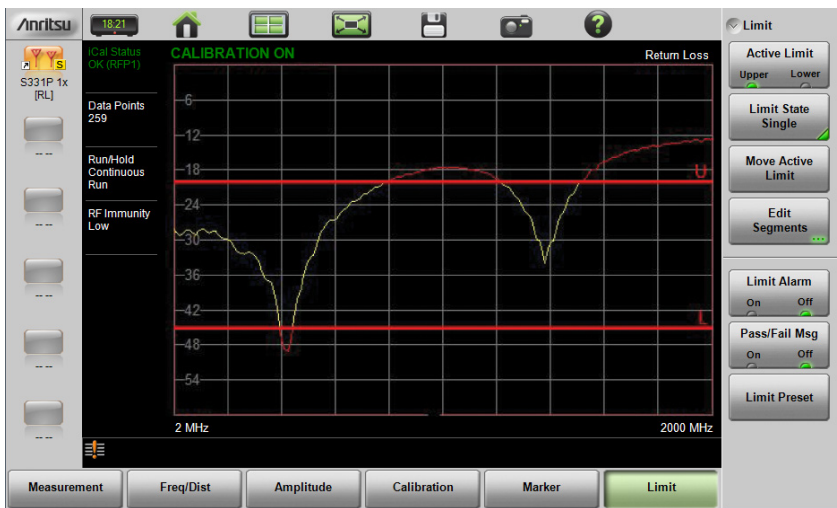


Figure 3-23. Limit Lines and Trace Showing Fail Colors

When editing a segmented limit line, a table is displayed with each segment in a separate row (Figure 3-24). The type is displayed as U or L. The Start and Stop settings are displayed as **Start(x1,y1)** and **Stop(x2,y2)**. In a Return Loss measurement, for example, the x-axis is in units of frequency, and the y-axis is in units of dB.

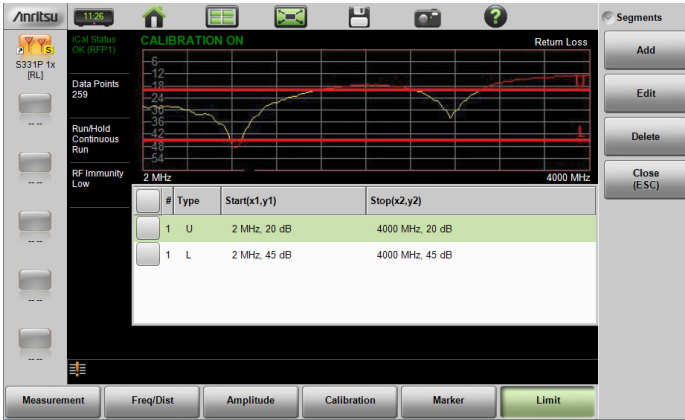


Figure 3-24. Table of Limit Lines (or Segments)

When adding or editing a segmented limit line, a dialog box (Figure 3-25) provides setting choices. You can choose Upper or Lower, then enter the x-axis and y-axis values for the segment Start and Stop. Differing y-axis values result in a sloping line segment.

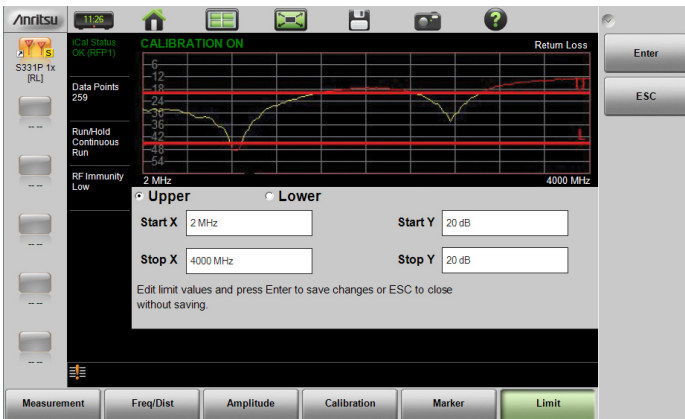


Figure 3-25. Segment Editing Dialog Box

Figure 3-26 shows a sequence of creating limit line segments for a filter measurement.



Figure 3-26. Creating Limit Line Segments

Figure 3-27 shows the result of moving limit line segments. Note that when moving upper or lower segments, all segments of the same type will be moved by the same amplitude value, meaning all upper or lower segments will move simultaneously. To change the value of a single segment, use the Edit Segments function.

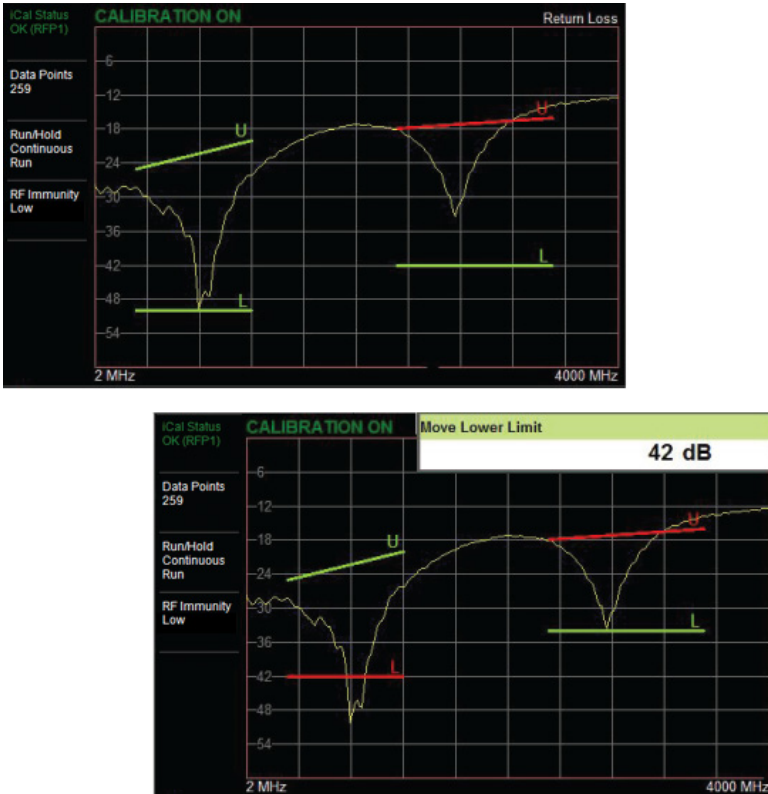


Figure 3-27. Moving Limit Line Segments

Limit Alarm

Press the Limit Alarm key under the Limit menu to turn on or off the audible Limit Alarm at the tablet or PC. Audio controls are set via the controller device.

Pass/Fail Messages

When set to On, a **Pass** or **Fail** message is displayed. Fail is displayed when the trace crosses or touches a limit line, as illustrated in [Figure 3-28](#). Note that Upper (U) or Lower (L) or both (U, L) are displayed. To change the size and location of the Pass/Fail message, tap the small circled arrow in the lower-right corner of the large format message box. The circled arrow is in the upper-left corner when the message is in small format.

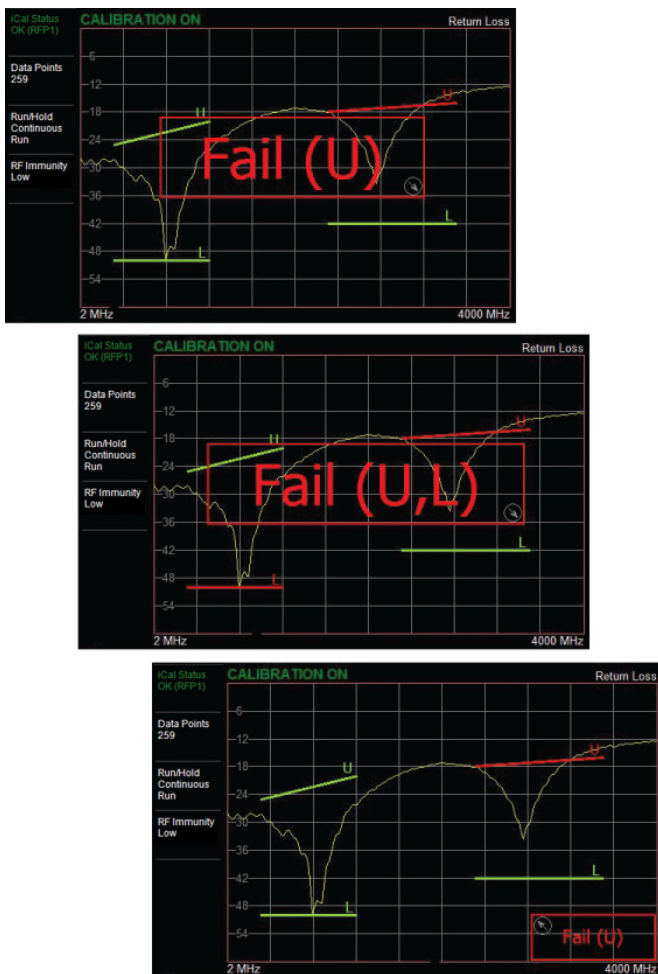


Figure 3-28. Pass/Fail Message Turned On

Markers

Markers can be applied to active or recalled measurements. The instrument supports eight markers. Marker information is stored in measurement and setup files and is displayed when either file type is recalled. Pressing the **Marker** main menu key will bring up the marker functions.

Overview of Markers:

- Frequency measurements (Return Loss, Cable Loss, and VSWR) have common markers. Distance measurements (DTF Return Loss and DTF VSWR) also have common markers.
- To turn on a marker, press the **Marker** main menu key, then press **Marker Setup** if the submenu is collapsed. Press the **Select (1-8)** key and select the desired marker number (M#).
- To turn off a marker, touch the marker line in the trace window to select it, then press the **M# On/Off** key, where # is the marker number.
- The currently selected marker is displayed as a red vertical line and is the highlighted row in the marker table.
- To move a marker, press the marker line and drag. To set a more exact location, press the marker to select, then press **Edit** and enter the frequency value.
- Markers set beyond the current frequency or distance range are displayed at either the left or right of the trace window.
- If the frequency (F1 or F2) or distance (D1 and D2) parameters are moved inside a current marker location, the out-of-range (---> or <----) indicator is displayed and marker values in the table are blanked (--). See [Figure 3-29](#) for an example of markers outside the current span.
- Marker location and type are stored after the marker is turned off.
- **Marker Preset** restores the markers to their default state. All markers are turned off except for Marker 1, which is set to the middle of the sweep. Previous marker information is not saved.

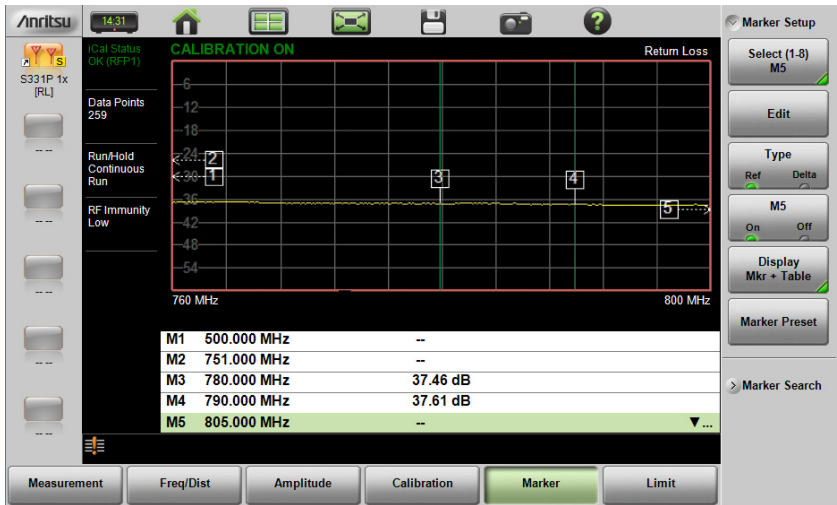


Figure 3-29. Markers 1, 2, and 5 are Out of Range

Select, Activate, and Place a Marker / Delta Marker

1. Press the **Marker** main menu key. To select a marker, press the **Select (1-8)** key under **Marker Setup**. Press one of the Marker buttons **M#** to turn the marker on and make it active. The active marker is shown in red.
2. Press the **Edit** key and use the virtual keypad to enter the frequency value in the edit box.
3. Press one of the unit keys as appropriate to apply the entered value and close the edit box.

To exit without making a change, press **Esc** to cancel the entry, and **Esc** again to close the edit box.

4. Markers 2 through 8 can be set as deltas to a reference marker. Use the **Type** key to set the marker type as **Reference** or **Delta** marker. [Figure 3-30 on page 3-38](#) illustrates using a delta marker to estimate the passband of a filter.

Marker Table

The Marker Table displays below the sweep window. The table lists marker frequency/distance and amplitude information for all markers currently on.

To display the marker table, press the **Marker** main menu key, then press **Display** under **Marker Setup**, and select **Mkr + Table**. To hide the table, select **Mkr Only**. The **Display Off** setting turns off both the table and all markers.

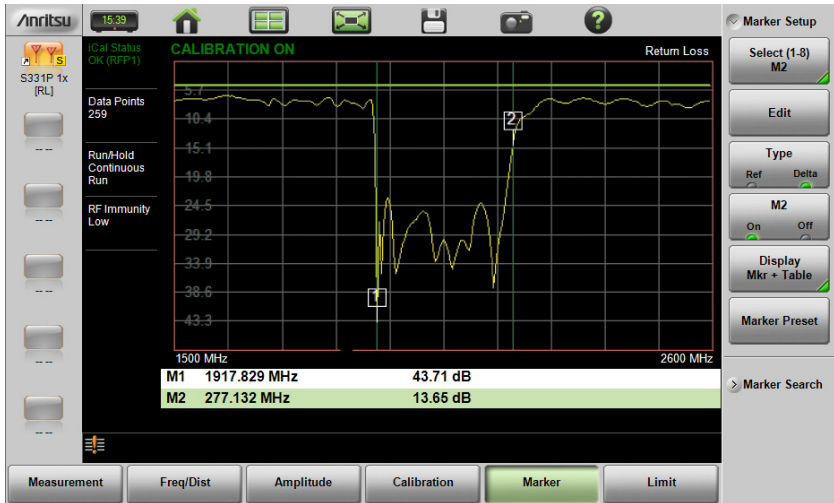


Figure 3-30. Delta Marker 2 and Marker Table

Marker Search

All the cable & antenna measurements include markers that will find trace peak and or trace valley automatically.

1. Press the **Marker** main menu key, then **Marker Setup** if the submenu is collapsed.
2. Press **Select (1-8)**, then press one of the Marker buttons **M#** to turn the marker on and make it active.
3. Press **Marker Search**.
4. Press **Marker To Peak** to set the marker to the peak of the measurement or **Marker To Valley** to set the marker to valley of the measurement.

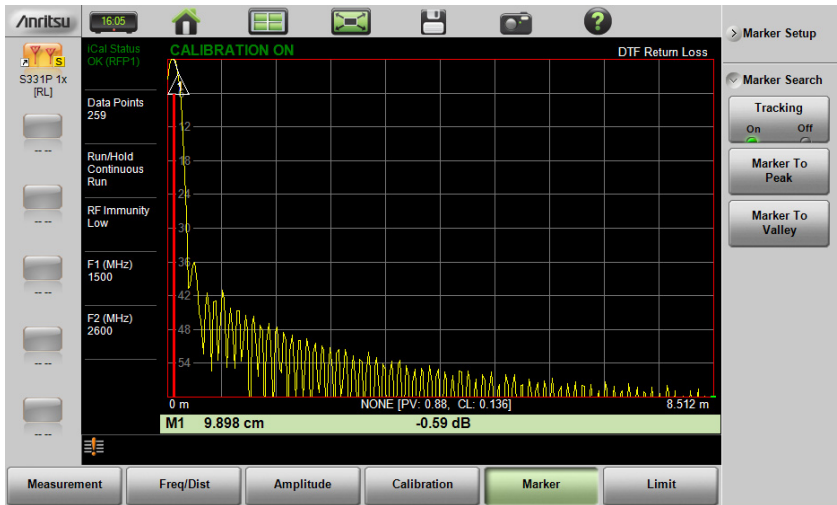


Figure 3-31. Marker Search, Marker 1 Set to Peak

Peak Between Markers

Another marker search option is to select the peak or valley between two markers instead of the entire displayed frequency or distance span.

Markers 5 and 7 can be used to find the peak or valley between Marker 1 and Marker 2.

Markers 6 and 8 can be used to find the peak or valley between Marker 3 and Marker 4.

This example illustrates finding the valley between Markers 1 and 2.

1. Turn on Markers 1 and 2. Refer to [“Select, Activate, and Place a Marker / Delta Marker”](#) on page 3-37 for details.
2. Select Marker 5.
3. Press Marker Search and select Valley Between M1 & M2. Marker 5 will move to the valley between M1 and M2. See [Figure 3-32](#). The valley search would also work if M1 and M2 were set and then turned off.

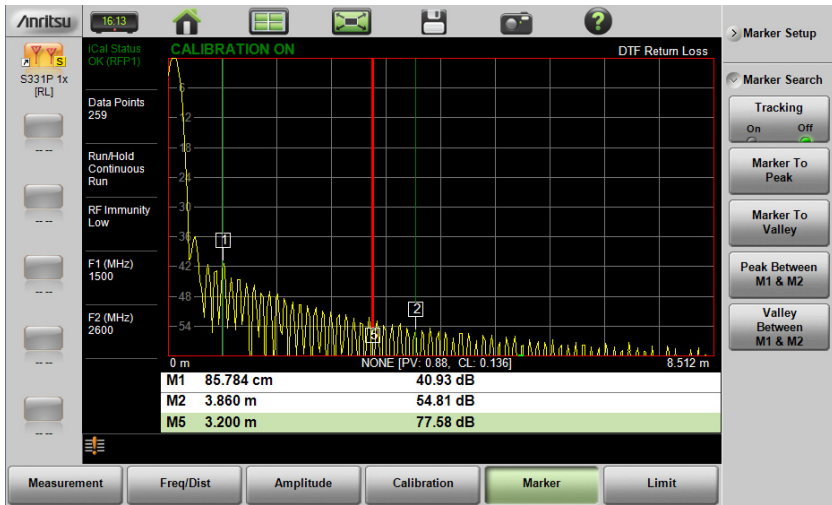


Figure 3-32. Bounded Marker Search

Tracking Markers

A tracking marker is set to a peak or to a valley. As the peak (or valley) varies in the measurement trace, the tracking marker stays at the peak (or valley).

Any marker can be set for tracking from the Marker Search menu. When set to Tracking, the marker number is displayed inside a triangle rather than a rectangle. For a Tracking marker set for Marker To Peak, the apex of the triangle points upward. For a Tracking marker set for Marker To Valley, the apex of the triangle points downward.

The markers that can be set for Peak Between can also be Tracking markers that are bounded by M1 and M2 or by M3 and M4.

Tracking markers can be especially helpful for specific measurements, such as tuning and testing filters or antennas.

In **Figure 3-33**, Marker M1 is set for Tracking a Valley. The three images show how the marker remains at the valley as the measurement trace changes.

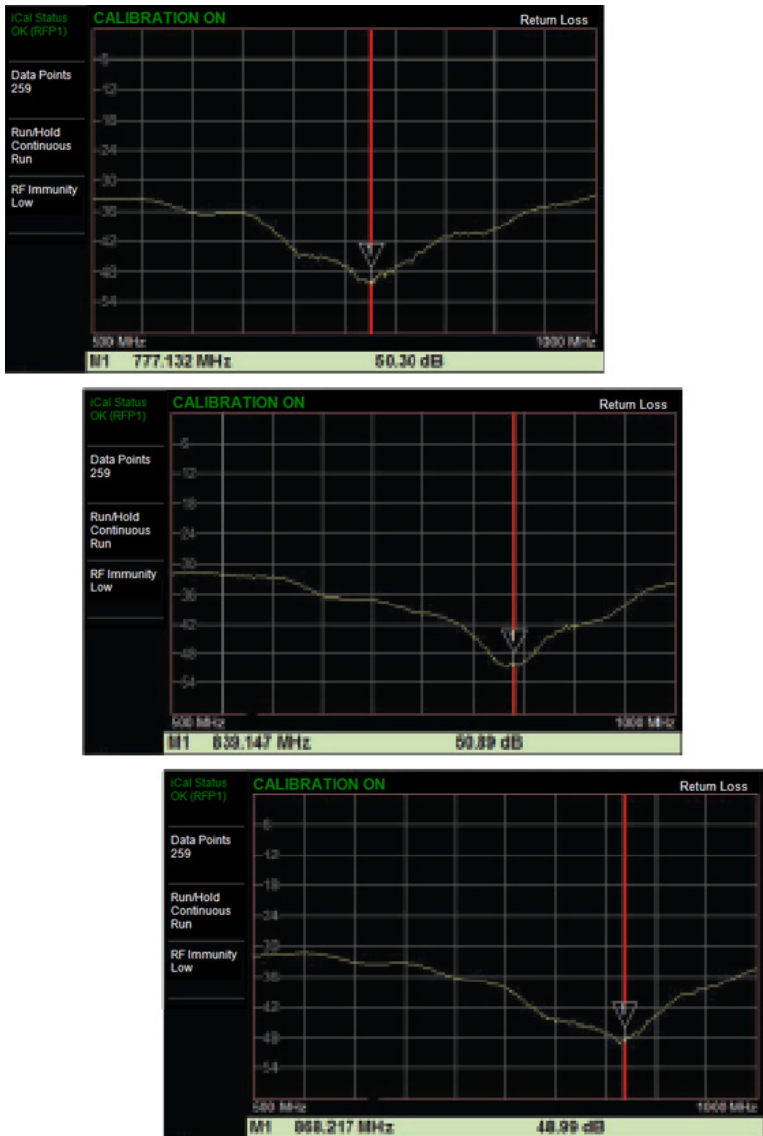


Figure 3-33. Tracking Marker Set to Valley

3-7 Trace

The Site Master S331P allows the user to concurrently view the live trace and a second trace that is stored in trace memory. The user can compare the two traces visually or using trace math functions. Pressing the **Trace** (5) main menu key will bring up the trace functions.

Overview of traces:

- Recalled measurements (.dat files) are automatically copied to trace memory and displayed.

Note Recalled measurements may change the current instrument settings.

- Copy Trace to Memory will replace whatever is in memory with the live (yellow) trace. The memory trace (purple) is displayed behind the live (yellow) trace.
- The default view is live Trace Only. View options (Trace Display) also include viewing only the trace in memory or both traces.
- View only trace memory to have marker values apply to the purple trace.

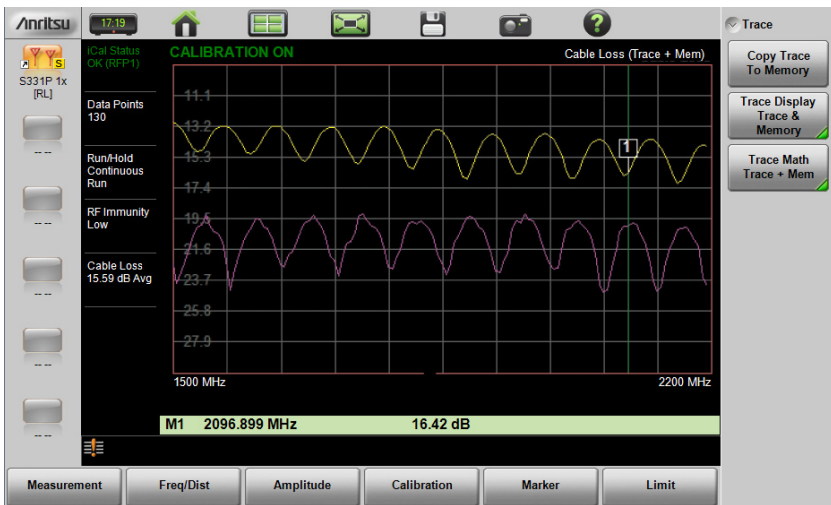


Figure 3-34. Displaying a Live Trace and a Static Trace from Trace Memory

Trace Display allows viewing of two traces to compare the trace stored in memory to the live trace. Trace Math operations include Trace – Memory, Trace + Memory and (Trc + Memory) / 2. Saved traces can also be recalled and compared with the live trace.

Trace Overlay

The examples below illustrate how the trace overlay feature can be used to compare the return loss measurements between two cables.

1. Connect the first cable and setup the measurement. Refer to [“Measurement Setup” on page 3-26](#) for additional information.
1. Press **Trace** (5), then Copy Trace To Memory.
2. Remove the first cable and connect the second cable.
3. Press Trace Display and select Trace & Memory. The purple trace from trace memory is displayed along with the live (yellow) trace.

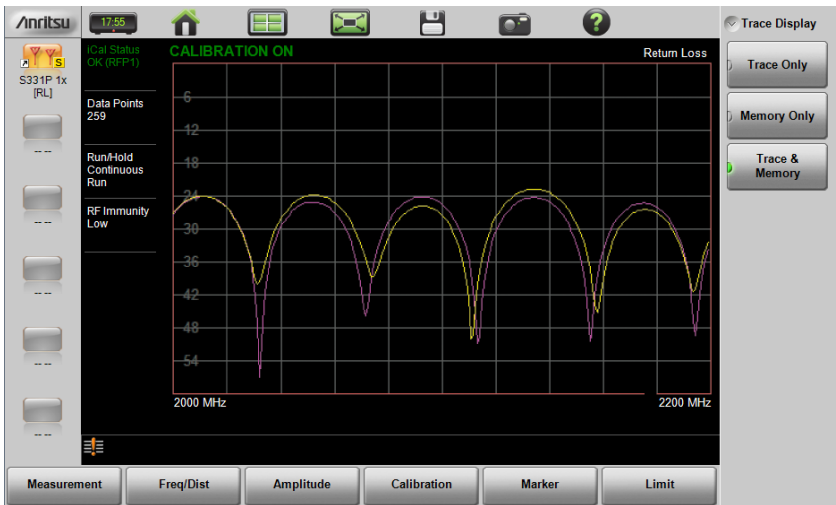


Figure 3-35. Trace Overlay of Two Cables

Note

The trace from memory can only be displayed if the measurement settings (except for Amplitude) have not changed since the trace was copied to memory.

If one of the traces is cut off, pressing **Amplitude** > Fullscale will adjust the reference level to display both traces.

Trace Math Example

The example below illustrates how the trace math features can be used to compare the phase of two cables.

1. Complete the steps described in “Trace Overlay” on page 3-43.
2. Press Trace Math and select Trace - Mem , Trace + Mem, or (Trc + Mem) / 2 (Figure 3-36).

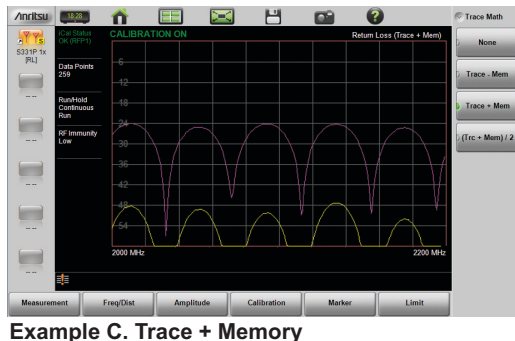
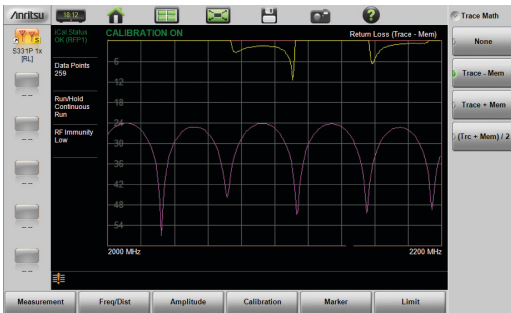
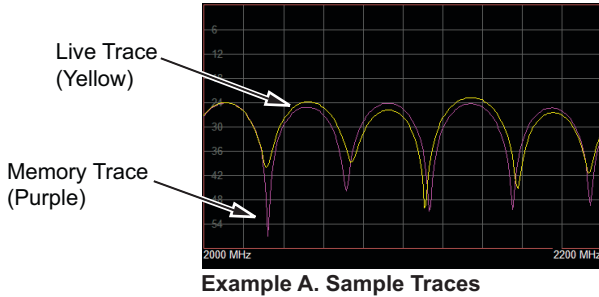


Figure 3-36. Trace Memory Used to Compare the Phase of Two Cables

The trace math functions often seem backwards to new users. The points to remember with Trace - Memory, Trace + Memory, and (Trc + Mem) / 2 are:

Notes

- The numbers on the y-axis are negative.
- The purple trace is added to or subtracted from the live trace. The sum or difference of the live trace and memory trace is displayed in yellow.

Table 3-1. Trace Math Details (1 of 2)

Example from Figure 3-36	Example Description
A. Sample Traces	Shows the live yellow trace and purple memory trace.
B. Trace – Memory	<p>In the Trace - Memory graph, the yellow trace is the result of subtracting the purple trace from the active trace (not displayed in Example B, Trace - Memory, but shown in Example A).</p> <p>Note that the yellow Trace - Memory is at 0 or above (and off the graticule) whenever the yellow trace is above (has a greater value than) the purple trace (refer to A).</p> <p>The two down sloping bumps in Example B are when the purple trace moves above the yellow trace. In Trace - Memory, this results in a negative value that is displayed.</p>
C. Trace + Memory	<p>In the Trace + Memory graph, the yellow trace is the result of adding the purple trace to the active trace (not displayed in Example C, Trace + Memory, but shown in Example A).</p> <p>Note that the yellow Trace + Memory is below 60 (and off the graticule) whenever adding the yellow trace value to the purple trace value is greater than 60 (refer to A).</p>

Table 3-1. Trace Math Details (2 of 2)

Example from Figure 3-36	Example Description
(Trace + Memory) / 2 <i>(not shown)</i>	<p>In the (Trace + Memory) / 2 graph, the yellow trace is the result of adding the purple trace to the active trace and then dividing the result by 2.</p> <p>This math function is most useful when measuring one-port Cable Loss (using the Cable Loss measurement).</p> <ol style="list-style-type: none"> 1. Connect a Short to the end of the cable and store the trace into memory. 2. Next, connect an Open to the end of the cable and apply (Trc + Mem) / 2 math function. <p>Because the ripple generated by the Short and Open are 180° out of phase, the effect of this math function will be to cancel out the ripple, resulting in a more accurate cable loss measurement.</p>

Refer to [“Trace Menu” on page 3-63](#) for additional information.

3-8 Measurement Review

Table 3-2 presents a summary of the typical measurements and required cable end tool. The typical values are for general information purposes. The carriers will provide final values in the acceptance testing specification.

Table 3-2. Cable and Antenna Measurement Overview

Measurement	Mode	End Tool	Marker
TYPICAL PASS/FAIL MEASUREMENTS			
Pass/Fail Test of Cable & Connectors	Freq Return Loss or (Freq, SWR)	Load	Peak
Pass/Fail Test of System Including Antenna	Freq Return Loss or (Freq, SWR)	Antenna	Peak
Frequency Range of Antenna	Freq Return Loss or (Freq, SWR)	Antenna	Valley
Cable Loss	Freq Cable Loss	Short or Open	Peak & Valley
Cable Loss (High Accuracy)	Freq Cable Loss (Open and Short) / 2 using trace memory function	Short and Open	Peak
Return Loss	Freq Return Loss	Load	Peak
TROUBLESHOOTING MEASUREMENTS			
Cable Length	DTF Return Loss or (DTF SWR)	Short or Open	Peak
Good Cable & Connectors	DTF Return Loss or (DTF SWR)	Load	Peak
Good System Including Antenna	DTF Return Loss or (DTF SWR)	Antenna	Peak

3-9 C&A Menu

Figure 3-37 and Figure 3-38 show the Cable and Antenna Analyzer Advanced Mode menu maps. The sections that follow describe function menus and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.

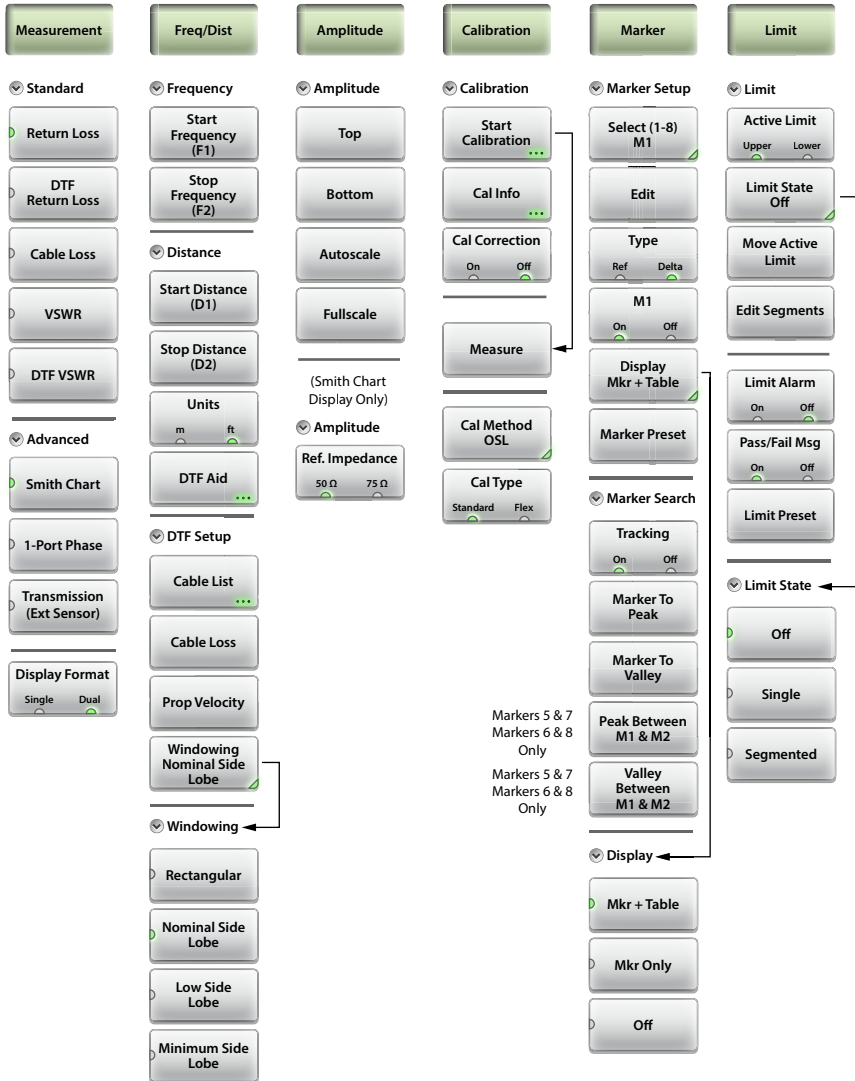


Figure 3-37. Cable & Antenna Analyzer Advanced Mode Menu Map

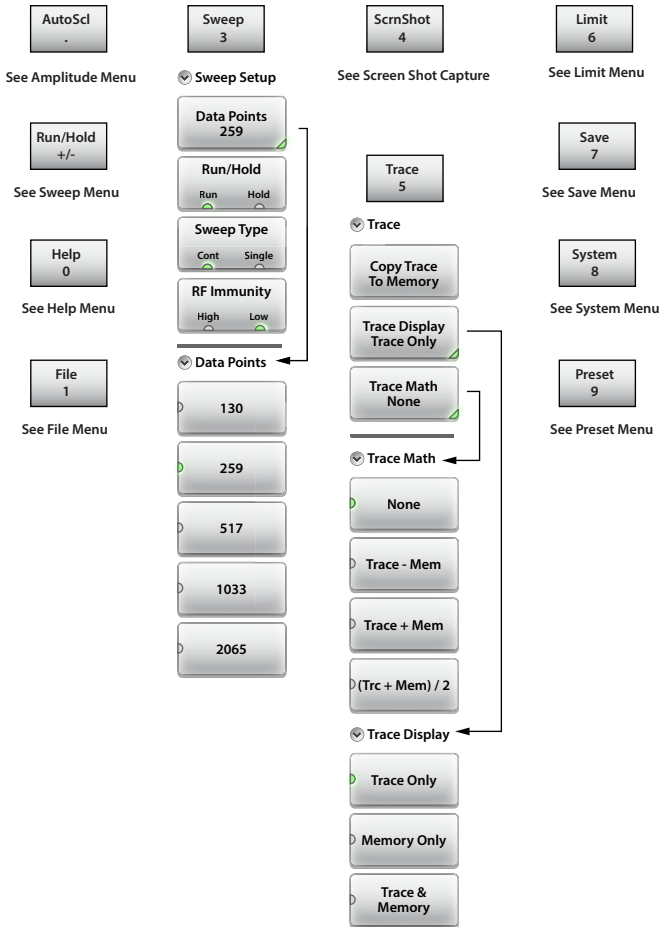


Figure 3-38. Virtual Keypad Function Keys

3-10 Measurement Menu

Key Sequence: **Measurement**









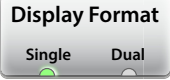
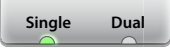
	<p>Standard:</p>
	<p>Return Loss: Return Loss is used to characterize RF components and systems. The Return Loss indicates how well the system is matched by taking the ratio of the reflected signal to the incident signal, and measuring the reflected power in dB.</p>
	<p>DTF Return Loss: The DTF measurement displays return loss values versus distance. If the frequency measurements fail or indicate a problem in the system, the DTF measurement can be used to identify and pinpoint the exact location of the problem. The DTF measurement shows the return loss value of all the individual components including connector pairs and cable components.</p>
	<p>Cable Loss: The cable loss test verifies the signal attenuation level of the cable.</p>
	<p>VSWR: Press the VSWR submenu key to view the impedance match in VSWR. VSWR is a ratio of voltage peaks to voltage valleys.</p>
	<p>DTF VSWR: Press this submenu key to display VSWR values versus distance. If the frequency measurements fail or indicate a problem in the system, the DTF measurement can be used to identify and pinpoint the exact location of the problem. The DTF measurement shows the VSWR value of all the individual components including connector pairs and cable components.</p>
	<p>DTF VSWR: Press this submenu key to display VSWR values versus distance. If the frequency measurements fail or indicate a problem in the system, the DTF measurement can be used to identify and pinpoint the exact location of the problem. The DTF measurement shows the VSWR value of all the individual components including connector pairs and cable components.</p>
	<p>See the next page for Advanced and Display Format options.</p>
	
	

Figure 3-39. Measurement Menu - Standard

Key Sequence: **Measurement** > Advanced



Standard

Advanced



Single

Dual

Advanced:

Smith Chart: Press this submenu key to view the measurement results in a Smith Chart. The Smith Chart is a graphical tool that is used to plot the impedance of the device connected to the Site Master. It converts the measured reflection coefficient data into impedance data and displays it in a manner that makes the Smith Chart a useful tool for determining and tuning input match. This complex impedance plot reveals which matching elements are necessary to match a device under test to the reference impedance (which can be set in the Amplitude menu to either 50 Ω or 75 Ω).

1-Port Phase: Press this submenu key to display the phase of the reflection measurement of the device connected to the RF port. The Phase display range is from -450 degrees to +450 degrees.

The 1-port phase measurement is most useful when making relative measurements (comparing the phase of one device to the phase of another) by utilizing the Trace Math function (Trace – Memory).

Transmission (Ext. Sensor): Press this submenu key to measure through the DUT. The Transmission measurement between the RF port and an External USB Sensor is used to measure the loss (or gain) in dB of a device. This measurement requires that one port of the device be connected directly (or through a test port cable) to the RF port of the Site Master. The second port of the device connects to the External USB Sensor.

Display Format

Single Dual: Press this submenu key to toggle the sweep window to show one trace (Single) or two traces (Dual). In dual display format, the active trace is framed with a red border. You can touch either trace to make it the active trace.

Figure 3-40. Measurement Menu - Advanced

3-11 Freq/Dist Menu

Key Sequence: **Freq/Dist**


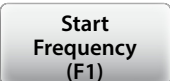

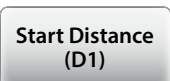

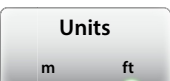

	<p>Frequency:</p>
<p>☑ Frequency</p>	<p>Start Frequency (F1): Press the Start Frequency (F1) submenu key and use the virtual keypad to enter the value in the edit box. See Figure 3-21 on page 3-26.</p>
	<p>Press one of the unit keys (GHz, MHz, kHz, or Hz) to apply the new value and close the edit box.</p>
	<p>To exit without making a change, press Esc to cancel the entry, and Esc again to close the edit box.</p>
<p>☑ Distance</p>	<p>Stop Frequency (F2): Press the Stop Frequency (F2) submenu key and use the keypad to enter the value in the edit box, then press one of the unit keys to apply.</p>
	<p>Distance:</p>
	<p>Start Distance (D1): Press the Start Distance (D1) submenu key and use the virtual keypad to enter the value in the edit box. See Figure 3-22 on page 3-27.</p>
	<p>Press one of the unit keys as appropriate to apply the entered value and close the edit box.</p>
	<p>To exit without making a change, press Esc to cancel the entry, and Esc again to close the edit box.</p>
<p>☑ DTF Setup</p>	<p>Stop Distance (D2): Press the Stop Distance (D2) submenu key and use the keypad to enter the value in the edit box, then press one of the unit keys to apply.</p>
	<p>Units: Press the Units key to toggle distance units between meters and feet.</p>
	<p>DTF Aid: Opens the DTF Aid dialog box (Figure 3-8). This interactive parameter box gives access to multiple specifiable measurement settings and displays maximum testing distance and resolution.</p>

Figure 3-41. Frequency/Distance Menu (1 of 2)

Key Sequence: **Freq/Dist** > DTF Setup






	<p>DTF Setup:</p>
<p>Frequency</p>	<p>Cable List: The Cable List submenu key opens a list of available cable specifications (see Figure 3-9 on page 3-13).</p>
<p>Distance</p>	<p>When a cable is selected from this list, propagation velocity and cable loss are automatically set by the instrument. If the preselected values for propagation velocity or cable loss are changed, the analyzer will use “NONE” as the cable type.</p>
<p>DTF Setup</p>	<p>Cable Loss: Press the Cable Loss submenu key and use the keypad to enter the value in the edit box.</p>
	<p>Press the unit key (dB/m or dB/ft) or press Enter to apply the value and close the edit box.</p>
	<p>To exit without making a change, press Esc to cancel the entry, and Esc again to close the edit box.</p>
	<p>Prop Velocity: Press the Prop Velocity submenu key and use the keypad to enter the applicable propagation velocity for the selected cable. Press Enter to apply the value and close the edit box.</p>
	<p>To exit without making a change, press Esc to cancel the entry, and Esc again to close the edit box.</p>
	<p>Windowing: Opens the “Windowing Menu” on page 3-54.</p>

Figure 3-42. Frequency/Distance Menu (2 of 2)

Windowing Menu

Key Sequence: **Freq/Dist** > DTF Setup > Windowing

<p> <input checked="" type="radio"/> Windowing <input type="radio"/> Rectangular <input checked="" type="radio"/> Nominal Side Lobe <input type="radio"/> Low Side Lobe <input type="radio"/> Minimum Side Lobe </p>	<p> Rectangular: Rectangular Windowing shows the highest side lobe levels (worst) and the greatest main lobe resolution (best). </p> <p> Nominal Side Lobe: Nominal Side Lobe Windowing shows less side lobe levels than Rectangular Windowing (good) but lower main lobe resolution (very good). </p> <p> Low Side Lobe: Low Side Lobe Windowing shows less side lobe levels than Nominal Windowing (very good) but lower main lobe resolution (good). </p> <p> Minimum Side Lobe: Minimum Side Lobe Windowing shows the lowest side lobe levels (best) but the least main lobe resolution (worst). </p>
--	---

Figure 3-43. Windowing Menu

3-12 Amplitude Menu

Key Sequence: **Amplitude**

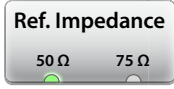


▼ Amplitude



(Smith Chart Display Only)

▼ Amplitude



Top: Press this submenu key to set the top amplitude value in the trace window. Use the virtual keypad to enter the value in the edit box, then press the dB key or **Enter** to apply the new power level and close the edit box.

To exit without making a change, press **Esc** to cancel the entry, and **Esc** again to close the edit box.

Bottom: This key sets the bottom amplitude value in the trace window. Use the keypad to enter the value in the edit box, then press the dB key or **Enter** to apply.

Autoscale: Automatically sets the top and bottom scales to the minimum and maximum values of the measurement with some margin on the y-axis of the display. The **AutoSci** (.) keypad key performs the same function.

Fullscale: Fullscale automatically sets the scale to the default setting. 0 dB to 60 dB for Return Loss measurements, 0 to 30 dB for Cable Loss, and 1 to 65 for VSWR measurements.

When measurement results are displayed in a Smith Chart, the Amplitude menu consists of a single key:

Ref. Impedance

50 Ω 75 Ω: Sets the reference impedance that is used for Smith Chart calculations to either 50 Ω or 75 Ω. The reference impedance determines the value of impedance at the center of the Smith Chart.

[Figure 3-45](#) illustrates a Smith Chart measurement, shown in dual display format.

Figure 3-44. Amplitude Menu

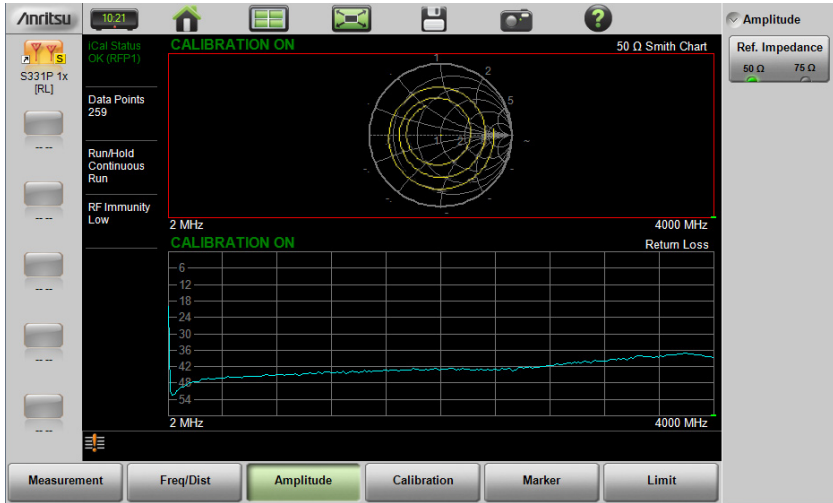


Figure 3-45. Set Reference Impedance for Smith Chart Measurement

3-13 Calibration Menu

Key Sequence: **Calibration**

	<p>Start Calibration: Opens the Calibration dialog box. Refer to Chapter 5, "Calibration" for detailed information.</p>
<p>Calibration</p>	<p>Cal Info: Displays the Calibration Information table showing the current and active calibration settings.</p>
	<p>Cal Correction: Turn Cal Correction On to apply the correction factor to the current measurement.</p>
	<p>Measure: Starts the calibrations process. Follow the on-screen instructions.</p>
	<p>Cal Method: The S331P only supports OSL calibration method.</p>
	<p>Cal Type: Toggles between Standard (fixed frequency range) and Flex (full frequency range) calibration.</p>

Figure 3-46. Calibration Menu

3-14 Marker Menu

Key Sequence: **Marker**


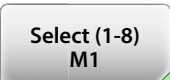
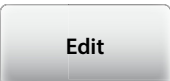


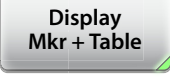


	<p>Marker Setup:</p>
<p>▼ Marker Setup</p>	<p>Select (1-8) M#: Press this key to open a submenu of 8 potential markers, then select a marker number, M1 through M8 to turn it on (if currently off) and make it active. Alternatively, you can make a marker active, that is, select it for editing, by tapping the vertical marker line on your tablet.</p>
	<p>Edit: Press this key and use the virtual keypad to enter the marker frequency in the edit box, then press one of the unit keys (GHz, MHz, kHz, Hz) to apply the entered value and close the edit box.</p>
	<p>To exit without making a change, press Esc to cancel the entry, and Esc again to close the edit box.</p>
	<p>Type: Sets the current active marker as a reference (standard) marker or a delta marker to Marker 1. Marker 1 is always the reference marker.</p>
	<p>M# (On Off): Toggles the display of the currently active marker on and off. When off, the location of the marker is stored. The active marker number is shown on the Select (1-8) M# key.</p>
	<p>Display (Mkr + Table, Mkr Only, Off): Press to open display options.</p>
	<p>Mkr+Table: Displays both the markers that are on and the marker table.</p>
	<p>Mkr Only: Displays markers that are on and hides the marker table.</p>
<p>▶ Marker Search</p>	<p>Off: Hides all markers and the marker table.</p>
	<p>Marker Preset: Turns off all markers except for Marker 1. Sets the location (frequency value) of Marker 1 to the middle of the sweep.</p>

Figure 3-47. Marker Menu (1 of 2)

Key Sequence: **Marker** > Marker Search


	<p>Marker Search:</p> <p>Tracking (On Off): When turned on, the active marker becomes a tracking marker and defaults to tracking the peak. To track valleys, press the Marker to Valley button after turning on tracking. The search settings can all be applied to a marker with tracking either on or off.</p> <p>Marker to Peak: Places the currently active marker on the highest signal amplitude currently displayed on screen.</p> <p>Marker to Valley: Places the currently active marker on the lowest signal amplitude currently displayed on screen.</p> <p><i>Markers 5, 6, 7, and 8 can perform a special Marker search to find the Peak or Valley between two other markers.</i></p> <p>When Marker 5 or Marker 7 is Active:</p> <p>Peak Between M1 & M2: Places Marker 5 or 7 on the highest signal amplitude between Marker 1 and Marker 2.</p> <p>Valley Between M1 & M2: Places Marker 5 or 7 on the lowest signal amplitude between Marker 1 and Marker 2.</p> <p>When Marker 6 or Marker 8 is Active:</p> <p>Peak Between M3 & M4: Places Marker 6 or 8 on the highest signal amplitude between Marker 3 and Marker 4.</p> <p>Valley Between M3 & M4: Places Marker 6 or 8 on the lowest signal amplitude between Marker 3 and Marker 4.</p>
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Figure 3-48. Marker Menu (2 of 2)

3-15 Limit Menu

Limit lines can be used for visual reference only or for pass/fail criteria using the limit alarm and Pass/Fail Message keys.

Key Sequence: **Limit** (6) or **Limit**



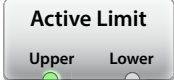



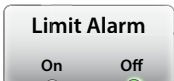
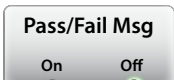

	<p><i>Limit</i></p> <p>Active Limit (Upper Lower): This key toggles the active limit line settings to the upper or lower limit.</p>
	<p>Limit State (Off Single Segmented): This key sets the limit line state to off, single, or segmented. See Figure 3-50, “Limit Line State Menu” on page 3-61. Limit line amplitude is stored even when turned off.</p>
	<p>Note: Both the upper and lower limit lines for a trace must be of the same type: either both are single, or both are segmented.</p>
	<p>Move Active Limit: Press this key to change the amplitude of the limit line (upper or lower). Use the virtual keypad to enter an amplitude value in the edit box, then press the dB key or Enter to apply the new power level and close the edit box.</p>
	<p>To exit without making a change, press Esc to cancel the entry, and Esc again to close the edit box.</p>
	<p>Edit Segments: Press this key to display the Segments menu and a table of limit line segments. Tap a segment (upper or lower), then choose a function from Figure 3-51 on page 3-61.</p>
	<p>Limit Alarm (On Off): When turned on, the Limit Alarm sounds a repeating beep at the controller device (tablet or PC) when the trace touches the limit line.</p>
	<p>Pass/Fail Msg (On Off): When turned on, a Pass or Fail message is displayed to indicate whether the trace touches or exceeds the limit line (Fail).</p>
	<p>Limit Preset: Turns both upper and lower limit lines off and clears limit amplitude settings. The next time a limit line is turned on, it will be displayed at its default amplitude level.</p>

Figure 3-49. Limit Menu

Key Sequence: **Limit** > Limit State

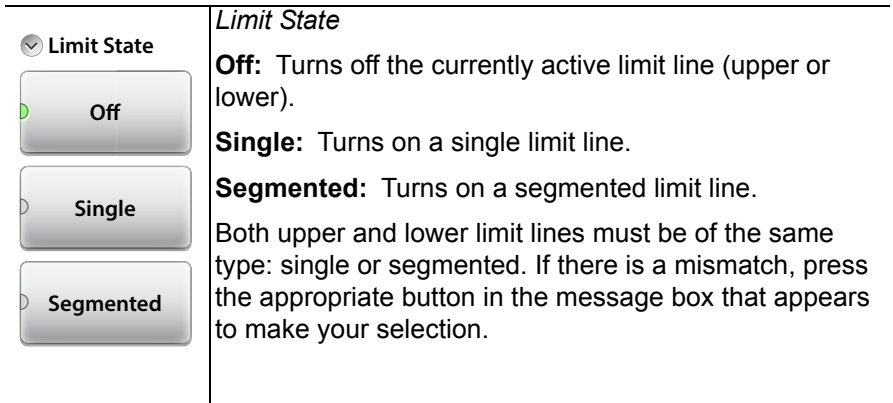


Figure 3-50. Limit Line State Menu

Key Sequence: **Limit** > Edit Segments

This function is available only with segmented limit lines. A message box is displayed if the current Limit State is Single, prompting you to press OK if you wish to change the existing limit line to segmented.

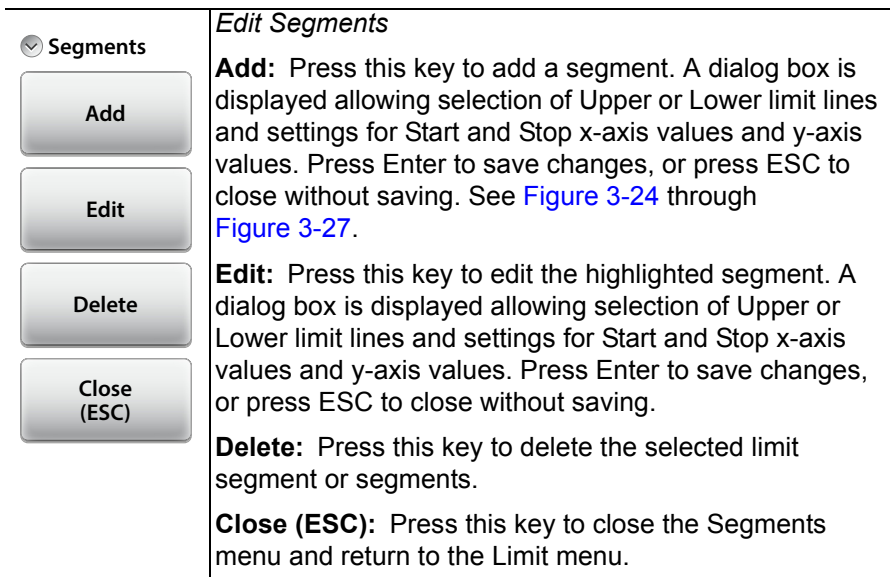


Figure 3-51. Limit Line Segments Menu

3-16 Sweep Menu

Key Sequence: **Sweep** (3)


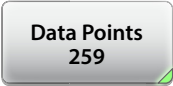



	<p>Data Points: Opens the Data Points submenu, where you can choose the number of data points: 130, 259, 517, 1033 or 2065.</p>
<p>☑ Sweep Setup</p>	<p>Run/Hold: Toggles between Run and Hold. When in Hold mode, pressing this key starts the sweeping and provides a trigger. When in the Run mode, pressing this key pauses the sweep.</p>
	<p>Sweep Type: Toggles between single sweep and continuous sweep. In single sweep mode, each sweep must be activated by pressing the Run/Hold key.</p>
	<p>RF Immunity, High / Low: Press this key to toggle between RF Immunity High and Low. The default setting is Low. See “RF Immunity” on page 3-29 for details.</p>
	
	

Figure 3-52. Sweep Menu

3-17 Trace Menu

Key Sequence: **Trace** (5)

	<p>Trace:</p> <p>Copy Trace to Memory: Copies the current trace display to memory for use in Trace Math and Trace Display options.</p> <p>Trace Display: Press to change the display options.</p> <p>Trace Only: The active trace is shown (yellow).</p> <p>Memory Only: The trace stored in memory is displayed in purple.</p> <p>Trace & Memory: Displays both the stored trace (purple) if a trace is stored in memory and the current active trace (yellow).</p> <p>Trace Math: Press to change the trace math options.</p> <p>None: The active trace is shown as is with no math functions.</p> <p>Trace – Mem: Displays the difference between the active trace and the trace in memory.</p> <p>Trace + Mem: Displays the results of logarithmic adding of the active trace and the trace in memory.</p> <p>(Trc + Mem) / 2: Displays the results of the average of the active trace and trace in memory.</p>
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Figure 3-53. Trace Menu

3-18 Other Menu Keys

Refer to [Table 2-1, “Site Master Keypad Functions”](#) on page 2-3.

Chapter 4 — Classic Mode Operation

4-1 Introduction

The Site Master S331P features a Classic Cable and Antenna Analyzer measurement mode, which allows users of Site Master legacy series (up to series D) to become efficient immediately. To provide quick and easy familiarity with the Site Master user interface, many of the advanced features such as Dual Screen display, Smith Chart, Phase, and multi-segmented limits, are purposely removed while in Classic Mode. Please switch to Advanced Mode to access these useful features when desired.

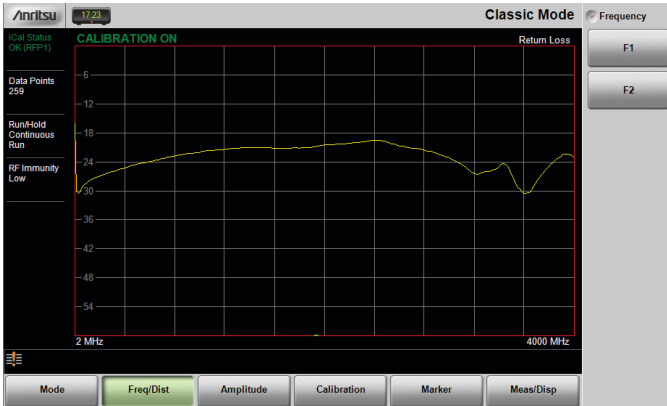
The primary purpose of Classic Mode is to help users of the S331P follow existing carrier's Method of Procedure (MOP) documents while they become more familiar with the instrument. There are many additional features and capabilities in Advanced Mode that make the transition well worth the time to learn its intuitive operation.

[Figure 4-1 on page 4-2](#) illustrates the Site Master S331P software interface in Classic mode versus Advanced mode.

Note	Classic Mode is displayed at the top of the interface screen when the instrument is in Classic mode. If not, press the Menu key and touch the Classic Mode icon in the Menu Shortcut window to switch operation modes.
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Many functions of the S331P are common between the Classic and Advanced measurement modes. Refer to [Chapter 3, “Cable and Antenna Measurements”](#) for a complete overview of the software GUI.

The Marker menu and the Limit menu in Classic mode are described [on page 4-6](#) and [on page 4-8](#).



Classic Mode



Advanced Mode

Figure 4-1. Display Appearance in Classic Mode vs. Advanced Mode

Descriptions of the main menus and associated submenus that are common between the Classic and Advanced measurement modes are provided in [Chapter 3](#) in [Figure 3-39](#) through [Figure 3-53](#).

Table 4-1. Menu Differences Between Classic Mode and Advanced Mode

Classic Mode	Advanced Cable and Antenna Mode
Mode Menu	“Measurement Menu” on page 3-50
Freq - SWR	“VSWR” on page 3-50
Freq - Return Loss	“Return Loss” on page 3-50
Freq - Cable Loss (one port)	“Cable Loss” on page 3-50
DTF - SWR	“DTF VSWR” on page 3-50
DTF - Return Loss	“DTF Return Loss” on page 3-50
—	“Smith Chart” on page 3-51
—	“1-Port Phase” on page 3-51
Freq/Dist Menu	“Freq/Dist Menu” on page 3-52
F1	“Start Frequency (F1)” on page 3-52
F2	“Stop Frequency (F2)” on page 3-52
D1	“Start Distance (D1)” on page 3-52
D2	“Stop Distance (D2)” on page 3-52
More	“DTF Setup” on page 3-53
Meas/Disp Menu	Refer to “Sweep Menu” on page 3-62 and “Trace Menu” on page 3-63
Marker Menu	
“Marker Menu” on page 4-6	“Marker Menu” on page 3-58
Limit Menu	
“Limit Menu” on page 4-8	“Limit Menu” on page 3-60

Note Refer to [Chapter 3](#) for descriptions of other menus not specifically mentioned in Table 4-1.

Figure 4-2 and Figure 4-3 show Cable and Antenna Analyzer Classic Mode menu maps.

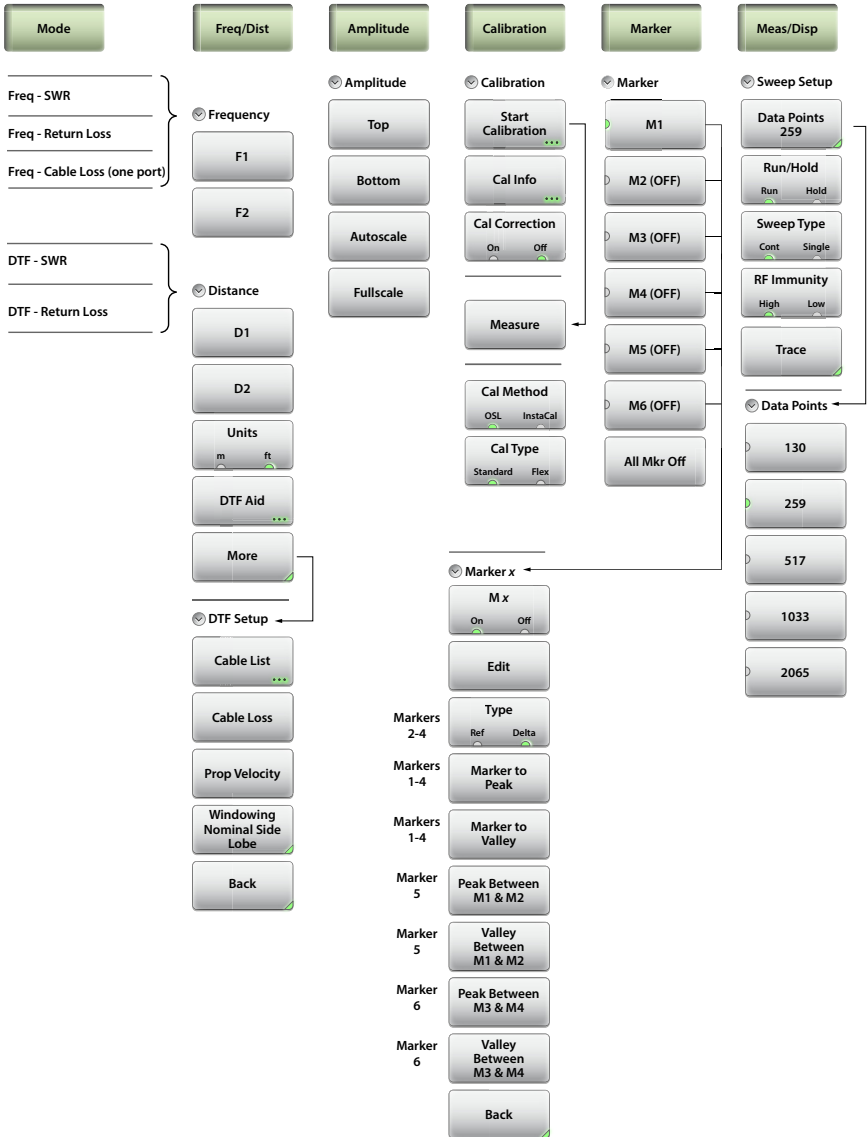


Figure 4-2. Cable & Antenna Analyzer Classic Mode Menu Map

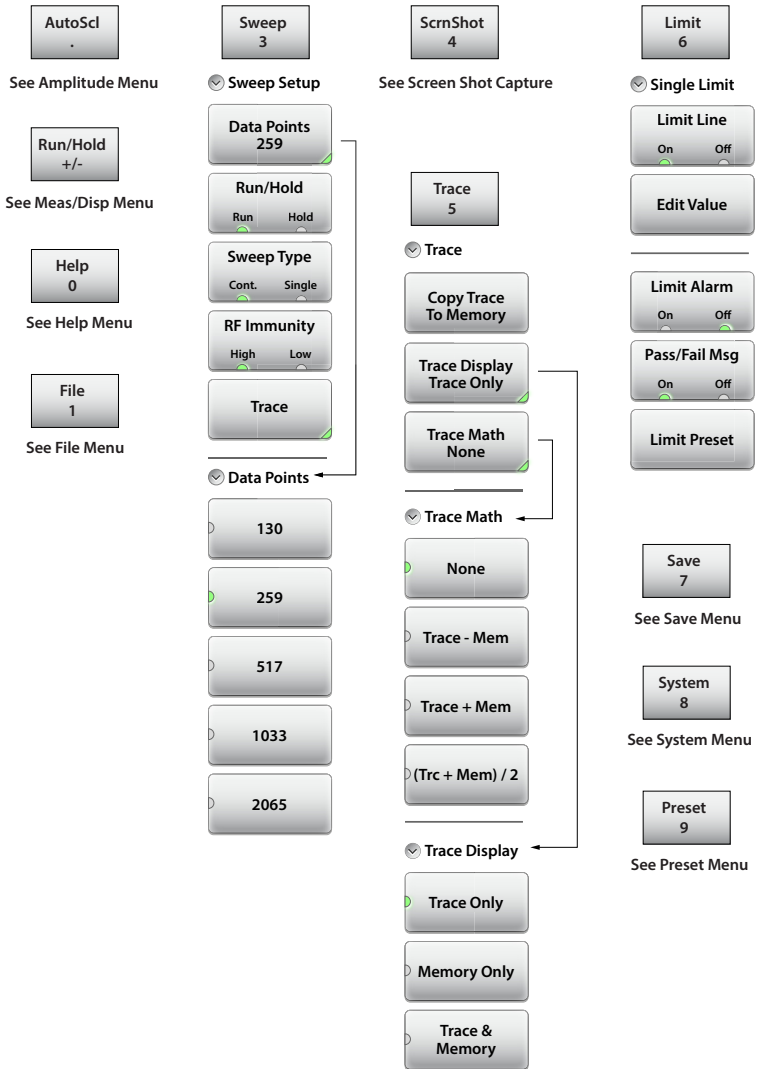


Figure 4-3. Keypad Function Keys

4-2 Marker Menu

Key Sequence: **Marker**










	<p><i>Marker</i></p> <p>After pressing the Marker button, Marker 1 (M1) is automatically turned on and appears at the last used location. If there is no last used location (after a preset, for example), Marker 1 will appear in the center of the measurement screen.</p>
	<p>M1: Press to display the Marker 1 menu (Figure 4-5 on page 4-7), which gives access to marker parameter settings.</p>
	<p>The key label displays the marker number only (M1 for example) when the marker is on, and displays M1 (OFF) when the marker is not in use. The green half circle indicates that the marker is currently selected.</p>
	<p>Submenu keys M2 through M6 behave in the same manner as M1.</p>
	
	
	
	
	<p>All Mkr Off: Press this key to turn OFF all markers.</p>

Figure 4-4. Marker Menu (1 of 2)

Key Sequence: **Marker** > M1

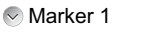

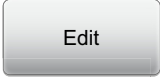



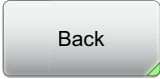
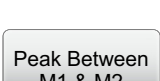
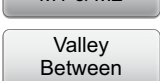
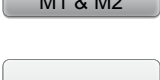
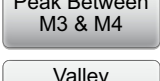
	<p><i>Marker</i></p>
	<p>M1 (On Off): Press this key to turn OFF the selected marker (M1 to M6).</p>
	<p>Edit: Press this key to enter a marker value.</p>
	<p>Type (Ref Delta): Press this key to toggle the marker type between Reference and Delta. This key is displayed for markers M2 through M4 only. Marker M1 is a reference marker only.</p>
<p>Markers 1-4</p> 	<p>Marker to Peak: Press this key to set a marker (M1 to M4 only) on the highest signal amplitude in the displayed trace.</p>
<p>Markers 1-4</p> 	<p>Marker to Valley: Press this key to set a marker (M1 to M4 only) on the lowest signal amplitude in the displayed trace.</p>
	<p>Back: Press this key to return to the Marker menu.</p>
<p>Marker 5</p> 	<p>Markers 5 and 6 can perform a special Marker search to find the Peak or Valley between two other markers. When Marker 5 is Active:</p>
<p>Marker 5</p> 	<p>Peak Between M1 & M2: Places Marker 5 on the highest signal amplitude between Marker 1 and Marker 2.</p>
<p>Marker 6</p> 	<p>Valley Between M1 & M2: Places Marker 5 on the lowest signal amplitude between Marker 1 and Marker 2.</p>
<p>Marker 6</p> 	<p>When Marker 6 is Active:</p>
	<p>Peak Between M3 & M4: Places Marker 6 on the highest signal amplitude between Marker 3 and Marker 4.</p>
	<p>Valley Between M3 & M4: Places Marker 6 on the lowest signal amplitude between Marker 3 and Marker 4.</p>

Figure 4-5. Marker Menu (2 of 2)

4-3 Limit Menu

Limit lines can be used for visual reference only, or for pass/fail criteria using the limit alarm and Pass/Fail Message keys.

Key Sequence: **Limit** (6)

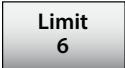
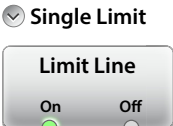

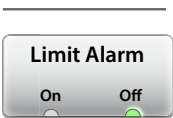
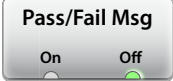


	<i>Single Limit</i>
	<p>Limit Line: This key toggles the limit line on or off. Limit line amplitude is stored even when turned off.</p>
	<p>Edit Value: Press this key to change the amplitude of the limit line (upper or lower). Use the keypad to enter an amplitude value in the edit box, then press the dB key or Enter to apply the new power level and close the edit box.</p>
	<p>To exit without making a change, press Esc to cancel the entry, and Esc again to close the edit box.</p>
	<p>Limit Alarm (On Off): When turned on, the Limit Alarm sounds a repeating beep at the controller device (tablet or PC) when the trace touches the limit line.</p>
	<p>Pass/Fail Msg (On Off): When turned on, a Pass or Fail message is displayed to indicate whether the trace touches or exceeds the limit line (Fail).</p>
	<p>Limit Preset: Turns both upper and lower limit lines off and clears limit amplitude settings. The next time a limit line is turned on, it will be displayed at its default amplitude level.</p>

Figure 4-6. Limit Menu

Table 4-2. Limit Lines Messages

Measurement	Typical End Tool	Pass/Fail Criteria
Return Loss	Load	Pass when the trace is below the limit line
DTF Return Loss	Load	Pass when the trace is below the limit line
Cable Loss	Short or Open	Pass when the trace is above the limit line
VSWR	Load	Pass when the trace is below the limit line
DTF VSWR	Load	Pass when the trace is below the limit line

Chapter 5 — Calibration

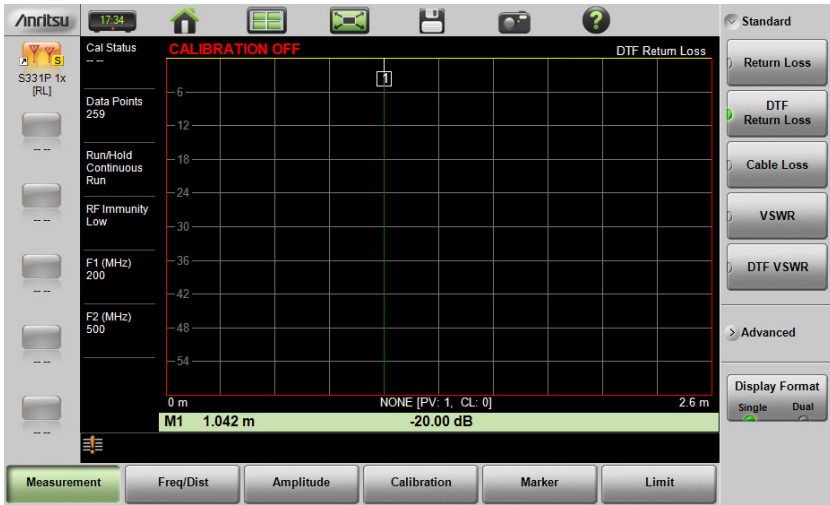
5-1 Introduction

This chapter provides details and procedures for calibrating the Cable-Antenna Analyzer modes of the Site Master S331P.

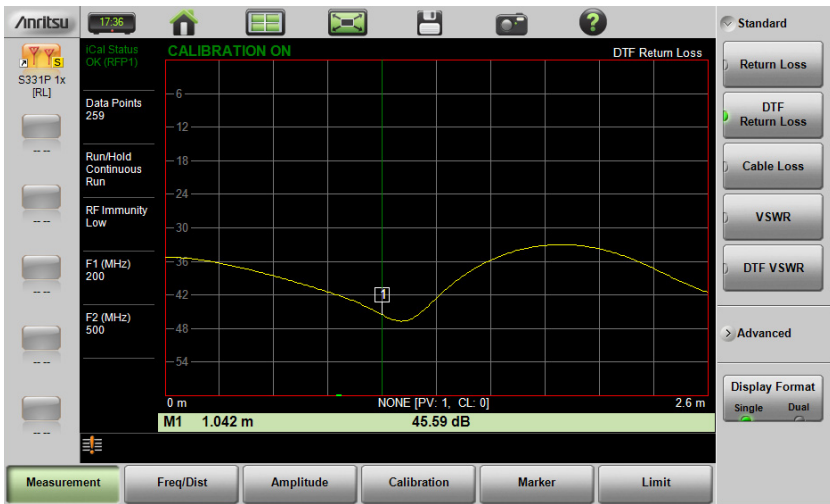
Anritsu recommends connecting a phase-stable test port cable (3 meters maximum length) to the RF port and calibrating at the open end of the cable using the Site Master S331P external OSL components.

Calibrating at the end of the test port cable will remove ripple and loss associated with the cable. Using a phase-stable cable allows the cable to be physically moved without affecting the measurement.

[Figure 5-1 on page 5-2](#) compares the Return Loss measurement of an open phase-stable cable before and after calibration.



Before Calibration



After Calibration

Figure 5-1. Comparison of Test Port Cable Before and After Calibration

5-2 Calibration Methods

Note For accurate results, the instrument must be calibrated before making any measurements.

The instrument must be re-calibrated whenever the internal instrument temperature exceeds the calibration temperature window (± 20 °C) or when the test port extension cable is removed or replaced. Unless the calibration type is Flex Cal, the instrument must also be re-calibrated every time the frequency range changes.

The instrument can be manually calibrated with an external precision OSL (Open-Short-Load) calibration tee. While OSL Cal tee provides the tools needed to perform the calibration, Standard Cal or Flex Cal determines the calibration frequency range. The default standard calibration is for a selected frequency range, and is no longer valid if the frequency is changed. Flex Cal is a broadband frequency calibration that remains valid if the frequency is changed.

Flex Cal calibrates the instrument over the entire frequency range and interpolates data points if the frequency range is changed. This method saves time as it does not require the user to re-calibrate the system for frequency changes. The trade-off is that the accuracy is not the same (fewer data points) as it would be with the standard calibration. If the frequency range will not be changed often, standard calibration is recommended for troubleshooting purposes. [Table 5-1](#) has a summary comparing the OSL Standard and Flex Cal settings.

Table 5-1. Summary of Calibration Types

Calibration Type	External OSL (Tee or Separate Components)
Standard Cal	Need to recalibrate if frequency changes. This will provide the best accuracy. Recommended for reporting.
Flex Cal	No need to recalibrate if frequency changes. Recommended for troubleshooting.

5-3 Calibration Procedures

In Cable and Antenna Analyzer Mode, calibration is required when the “Calibration Off” or “Cal Status --” message is displayed or when the test port cable has been changed. The following sections detail how to perform OSL calibration.

Note	If a Test Port Extension Cable is to be used (recommended), it must be connected to the Site Master before calibration.
-------------	---

Calibration Procedure

1. Press the **Freq/Dist** main menu key and enter the appropriate frequency range.
2. Press the **Calibration** main menu key, then press **Start Calibration**.
3. Select either **Standard** or **Flex**.
4. Press **Measure** and follow the on-screen instructions ([Figure 5-2 on page 5-5](#)).
5. When done, select **Apply**.
6. Verify that the calibration has been completed by confirming that the Cal Status message is now displaying the following:
Cal Status OK (RFP1) for 1-port standard or
iCal Status OK (RFP1) flex reflection calibrations using OSL.
7. The calibration correction factor will now be applied to the measurements.

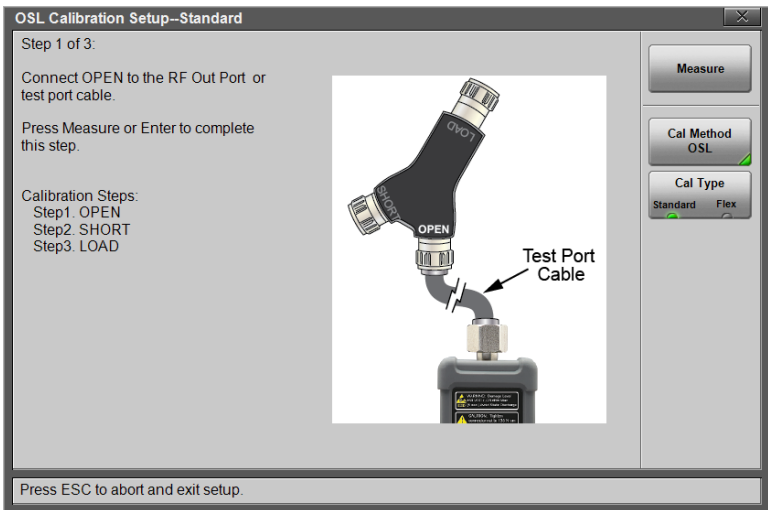


Figure 5-2. Calibration Setup OSL Cal

Cal Info

From the **Calibration** main menu, press **Cal Info** to review the Active Cal Settings and a summary of the current instrument settings (Figure 5-3). Press **ESC** to close.

Calibration Information [Cal Status: OK]		
Type	Current Settings	Active Cal Settings
Date/Time	03 Aug 2016 / 15:22:44	03 Aug 2016 / 15:10:38
Internal Temp	0 °C / 32 °F	0 °C / 32 °F
Valid Cal Window	--	-20 to 20 °C / -4 to 68 °F
Cal Type	Standard	Standard
Cal Method	OSL	OSL
# of Points	259	1033
Start Frequency	2 MHz	2 MHz
Stop Frequency	4000 MHz	4000 MHz

Press ESC to close this dialog.

Figure 5-3. Calibration Information

The calibration factor can be turned Off with the Cal Correction button. The calibration coefficients are saved and can be reapplied by setting Cal Correction back to On.

Temperature Window

Anritsu recommends allowing the instrument to warm up for ~10 minutes to typical operating temperature before calibrating. Any applied calibration factor will automatically be turned off if the internal temperature moves outside the valid cal window. The Site Master will display: **CALIBRATION OFF (↓°C)** and a new cal will be required.

Save and Recall Calibration Coefficients

Calibration information is included when a setup (.stp) file is saved (even if the Cal Correction is Off). The calibration information is also recalled with a setup file and can be applied (**Calibration > Cal Correction On**) if the current internal instrument temperature is within the saved cal window.

Calibration information is not included when a measurement (.dat) file is saved.

5-4 Calibrate Menu

Key Sequence: **Calibration**

The screenshot shows a vertical list of menu items. At the top is a green 'Calibration' button. Below it is a 'Calibration' header with a dropdown arrow. The main menu items are: 'Start Calibration' (with a right arrow and three dots), 'Cal Info' (with a right arrow and three dots), 'Cal Correction' (with 'On' and 'Off' radio buttons, 'Off' is selected), 'Measure' (with a left arrow), 'Cal Method OSL' (with a right arrow and a green checkmark), and 'Cal Type' (with 'Standard' and 'Flex' radio buttons, 'Standard' is selected).

Start Calibration: Press this submenu key and follow the instructions on screen.

Measure: Starts the calibration process.

Cal Method: The S331P supports OSL calibration only.

Cal Type: Toggles between Standard Cal and Flex Cal. See [Table 5-1 on page 5-3](#) for details.

Cal Info: Displays information about the current settings and active cal settings. See [Figure 5-3 on page 5-5](#).

Cal Correction On Off: Determines whether the active cal is applied to the current measurement.

Figure 5-4. Calibration Menu

Chapter 6 — File Management

6-1 Introduction

This chapter describes the file management features of the Site Master S331P. The File menu and associated submenus allow you to save, recall, copy, and delete files in the controller device (tablet or PC) local drive or a removable disk.

The File menu is accessed by pressing the **File** (1) keypad key on the Site Master software interface screen.

6-2 Overview

Remember the following tips when reviewing this chapter:

- File management functions apply to files on your tablet or PC local disk or a removable disk.
- Select the destination for saved files using the **Location** button and the **Set Location** key in the Save dialog box.
- Rename saved files under the File Management menu (**File** (1) > **File Mgmt**).
- Sort files by tapping a column heading.
- Move up and down file lists using the buttons under the **Navigation** submenu.
- Press **Esc** to return to the previous screen.
- Saved measurements also contain setup information.
- Recalled measurements display in purple and may change the current instrument settings (*which will not be saved*) in order to display the recalled measurement.
- Calibration information is recalled with setup files but not recalled with measurement files.

6-3 File Types

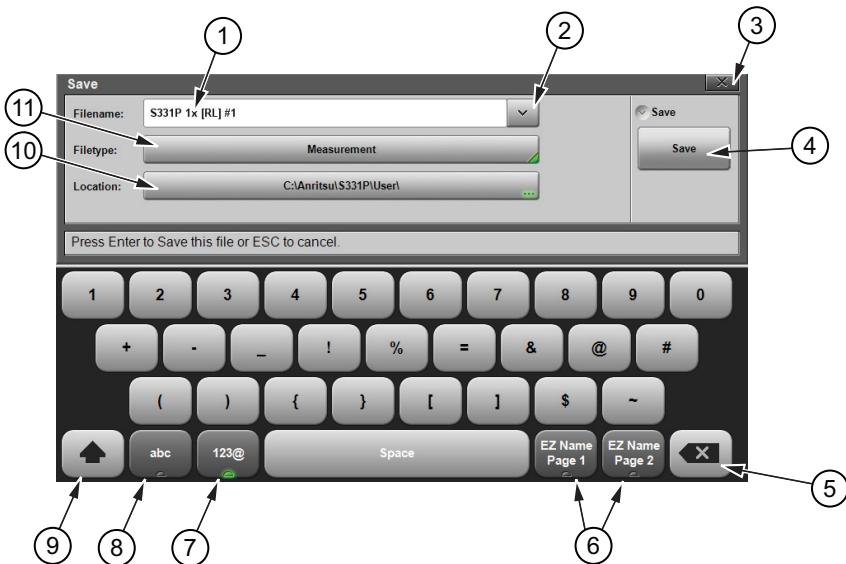
File name extensions used in the Site Master S331P include:

- * .dat for Cable and Antenna measurement files
- * .ett for easyTest files
- * .stp for Setup files
- * .png for Screen Shot files
- * .csv text file with Comma Separated Values (CSV), for saving formatted data
- * .txt for saving Status information and Self Test results

6-4 Save File

Press the **Save** (7) keypad key to open the Save dialog box.

Alternatively, you can press the Save icon in the “[System Function Tool Bar](#)”, or press **File** (1) on the keypad, then press **Save**.



1	File name edit box
2	Recent file names (tap to view)
3	Close dialog box (without saving)

Figure 6-1. Save Dialog Box (1 of 2)

4	Press Save to save the file and close the dialog box. Press Esc or the Close button (item 3 above) to cancel.
5	Delete or Backspace key (applies to file name field)
6	EZ Name keys.
7	Digits and symbols keyboard
8	Alphabetic keyboard
9	Shift key
10	Current save location. Tap the button to change the save destination.
11	Current file type. Tap the button to change.

Figure 6-1. Save Dialog Box (2 of 2)

File Name

In the **Filename** edit box, you can either use the default name or enter a custom name. The default name is based on the instrument model, current display format and measurement type, and a sequence number. For example:

S331P 1x [RL] #5, where:

1x = Single display

2x = Dual display

RL = Return Loss

DTF-RL = Distance to Fault Return Loss

CL = Cable Loss

VSWR = Voltage Standing Wave Ratio

DTF-VSWR = Distance to Fault Voltage Standing Wave Ratio

SC = Smith Chart

PH = 1-Port Phase

The file sequence number (#n) is automatically incremented each time a file of the same type is saved.

Note	The file extension is determined by the type of file being saved: measurement (.dat), setup (.stp), screen shot (.png), text (.txt), or CSV (.csv).
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To enter a custom file name, simply type over the default name. Optionally, you can use the EZ Name keyboards to quickly enter character strings that make up a custom file name.

EZ Name Keyboards

Some carriers may require files to be named according to specific conventions, including site ID, color coding, measurement type, termination device, and frequency information.

Press one of the two EZ Name Page Selection keys to display the EZ Name keyboard, then touch an EZ Name key to enter the corresponding preset character string in the Filename edit box.



EZ Name Page 1 Keyboard



EZ Name Page 2 Keyboard



Figure 6-2. EZ Name Keyboards

The Separator keys determine whether to automatically insert a separating character (hyphen or underscore) after each name string entered by pressing an EZ Name key.

EZ Name Keys

Pressing an EZ Name key inserts the associated character string into the name of the file being saved. To define your own EZ Name keys or rename an existing key:

1. Press **Rename Keys** on the appropriate EZ Name keyboard (Page 1 or Page 2). See [Figure 6-2](#).

2. Press the EZ Name key you want to define or rename.
3. Enter a new name, e.g., GREEN, for the selected key.

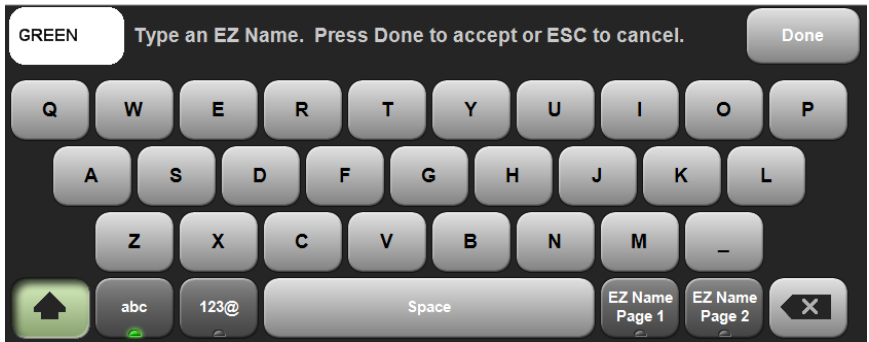


Figure 6-3. Renaming an EZ Name Key

4. Press Done to apply the character string to the EZ Name key. The EZ Name keyboard now shows the key with its new name. In the example, one of the Color Code keys was renamed.



Figure 6-4. Renamed EZ Name Key

Note

User-defined EZ Name keys are saved until a Master Reset is performed or you delete custom files with **Preset (9) > Reset > Delete Custom Files > Keyboard EZ Names**. Refer to the [“Preset Menu” on page 7-11](#).

File Type

The default file type in the Save dialog box is Measurement. To select a different type of data to save, press the **Filetype** button, then touch the appropriate key under the File Type menu. The selected file type determines the file name extension, as shown in [Figure 6-5](#).

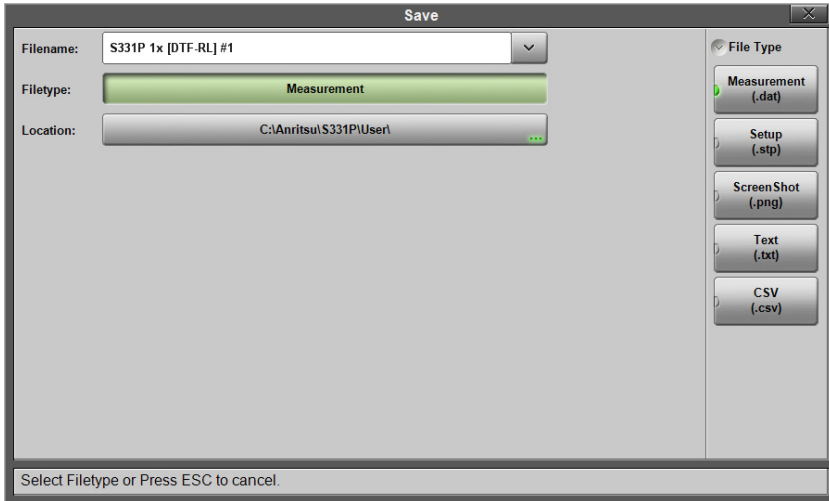


Figure 6-5. Save File Type

Measurement files are typically saved for reporting and monitoring. They contain both the measurement data and setup data.

Setup files help ensure consistent instrument setup when making future measurements. They contain basic setup details including: measurement type, frequency span, distance span, DTF setup, amplitude settings, markers, limit lines, calibration coefficients, and additional instrument settings (data points, run/hold status).

Screen shot files contain a screen capture of the current display. The image appearance is set using the [“ScrnShot Settings”](#) on page 7-10.

The CSV and text files contain setup information and final formatted data that are shown on the instrument display screen. This file information includes any post-processing that was done on the data (smoothing, trace math, time domain, and so forth). These files contain the data for any traces that are displayed, including the memory traces. They also contain the markers that are turned on when the file is saved.

Save Location

The current save destination is shown on the **Location** button in the Save dialog box. To change to another location, press the **Location** button and select where to save the file. Double-tap a folder to open it.

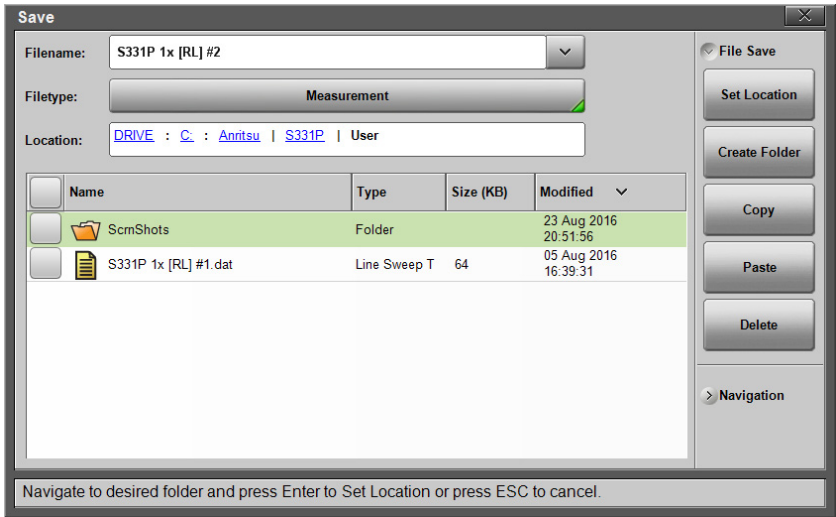


Figure 6-6. File Save Location

Files can also be saved to an external storage drive like a USB removable disk. Double-tap Drive: in the Location directory path to open the dialog below, then select the removable disk and press **Enter**. Select or create any subfolders as needed.

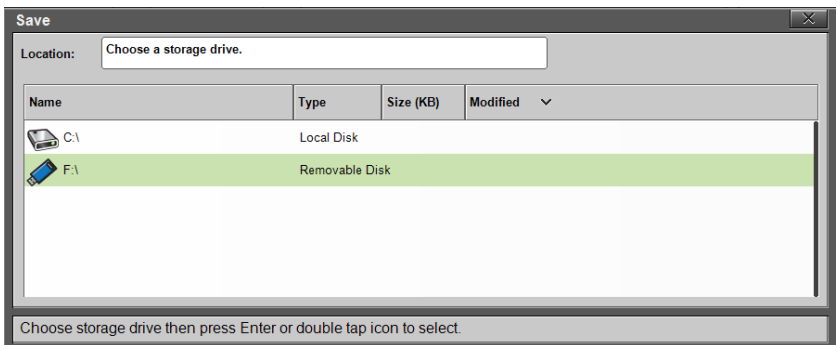


Figure 6-7. Select Storage Drive

6-5 Recall File

You can recall a previously saved measurement or setup or a screen shot file either from local disk on the controller PC or from a removable drive. Only one file of any type can be recalled at a time.

Note Recalling a measurement or setup may change the current instrument settings and turn off any calibration correction. Consider saving the current setup before recalling a file.

Recall a Measurement

1. Press the **File** (1) key to display the File menu.
2. Press Recall to open the Recall dialog box.
3. Press the Filetype button, then touch **Measurement** or **All** to list only measurement files or all file types, respectively.
4. Press the **Location** button and navigate to the desired measurement file (.dat). Select it, then press **Enter** on the keypad pane (or **Recall** in the Recall dialog).

In the example below, the selected file is a Cable Loss measurement file located on external storage drive E:

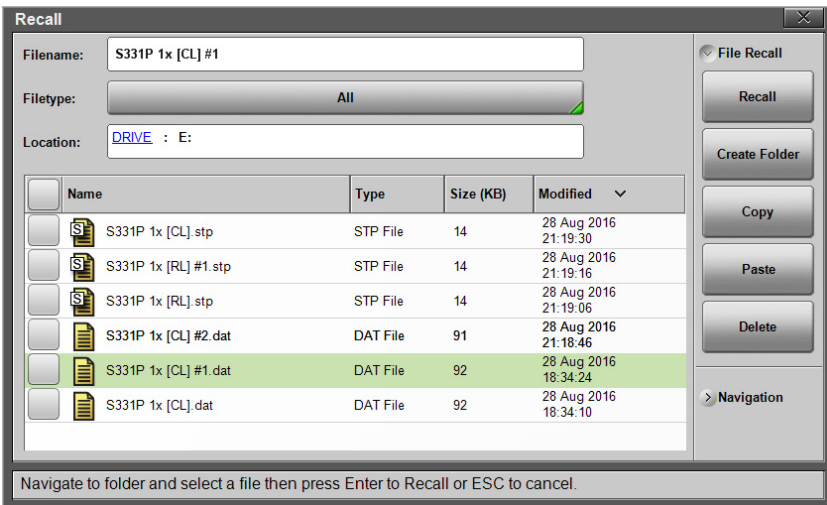


Figure 6-8. Recall Dialog Box

5. In the preview screen that opens, press **Enter** to complete recalling the measurement. To cancel the recall and return to the File Recall menu, press **ESC**.

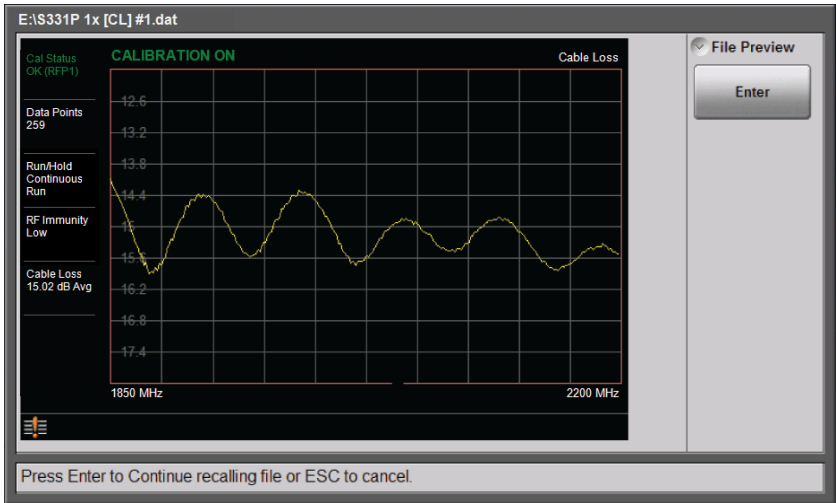


Figure 6-9. Preview of a Recalled Measurement

6. Figure 6-10 illustrates a recalled measurement and active trace.

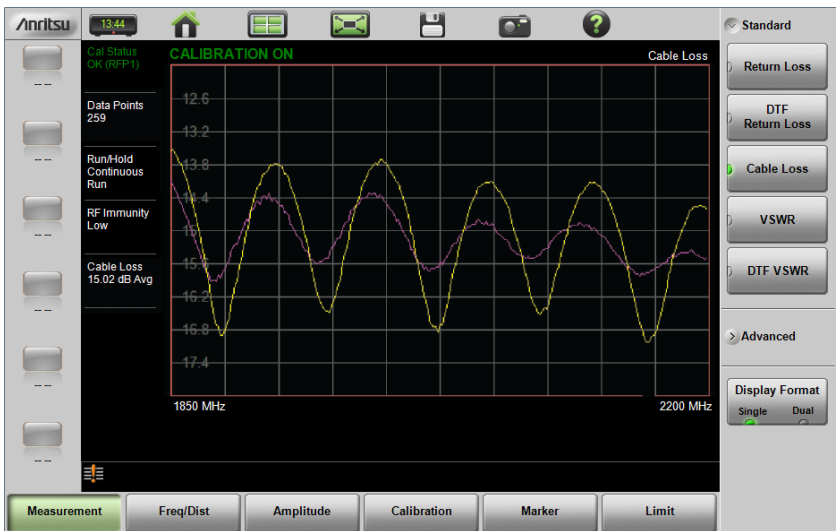


Figure 6-10. Recalled Measurement and Active Trace

The recalled measurement is the purple trace and is overlaid on the current active (yellow) trace. In [Figure 6-10](#) the recalled measurement is used to compare the cable loss of two different RF cables. Recalled measurements are automatically saved to trace memory for use in trace match functions. To see the recalled measurement and the current measurement simultaneously, select **Trace & Memory** in the Trace Display submenu. Refer to [“Trace” on page 3-42](#).

Recall a Setup

Setup files contain basic instrument setup details including: measurement type, frequency span, distance span, DTF setup, amplitude setting, markers, limit line, calibration coefficients, and additional instrument settings (data points, run/hold status). Recalling a setup may change the current settings.

1. Press the **File** (1) key to display the File menu.
2. Press **Recall** to open the Recall dialog box.
3. Press the **Filetype** button, then touch **Setup** or **All** to list only setup files or all file types, respectively.
4. Press the **Location** button and navigate to the desired setup file (.stp extension).
5. Double-tap the file to recall the setup. Alternatively, you can press the file name to select, then press **Enter** on the keypad pane (or **Recall** in the Recall dialog).

Recall/Preview a Screen Shot

1. Press the **File** (1) key to display the File menu.
2. Press **Recall** to open the Recall dialog box.
3. Press the **Filetype** button, then touch **ScreenShot** or **All** to list only screen shot files or all file types, respectively.
4. Press the **Location** button and navigate to the desired screen shot file (.png extension).
5. Select the file, then press **Enter** on the keypad pane (or **Recall** in the Recall dialog). Alternatively, you can simply double-tap a file in the list to recall the screen shot.

In the example below, the selected file is located in the default ScrnShots folder on local disk.

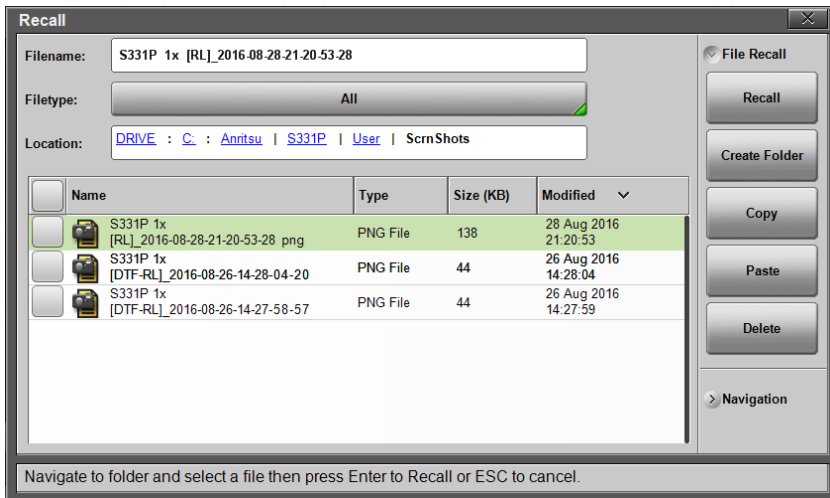


Figure 6-11. Screen Shot Selected for Recall

6. A preview screen displaying the selected screen shot is illustrated in Figure 6-12. Press **ESC** to return to the File Recall menu.

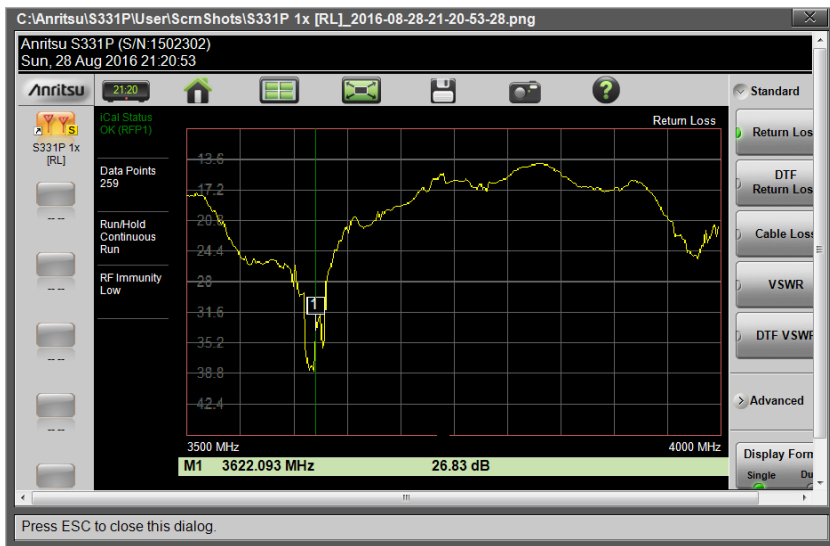


Figure 6-12. Preview of a Recalled Screen Shot

6-6 Rename File

1. Press the **File (1)** key to display the File menu.
2. Press File Mgmt to open the File Mgmt dialog box.
3. Navigate to the file you wish to rename and press to select.

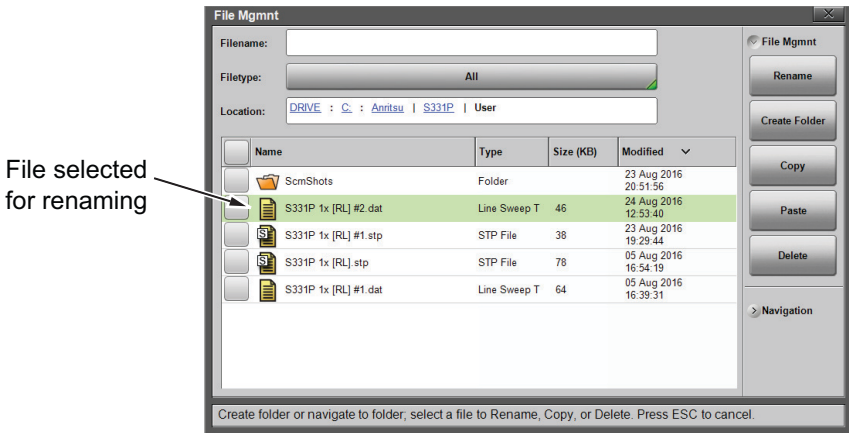


Figure 6-13. Select a File to Rename

4. Press the Rename submenu key to open the New Name edit box and on-screen keyboard.
5. Enter the new file name. Optionally, you can use the EZ Name keyboards to enter preset character strings. Refer to [“EZ Name Keyboards”](#) on page 6-4.

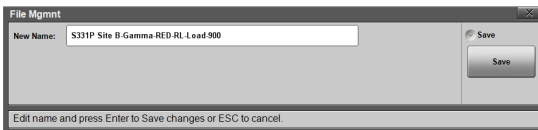


Figure 6-14. Enter a New File Name

6. Press **Save** to apply the new file name and return to the File Mgmnt dialog box.

Figure 6-15 illustrates the file directory with the renamed file.

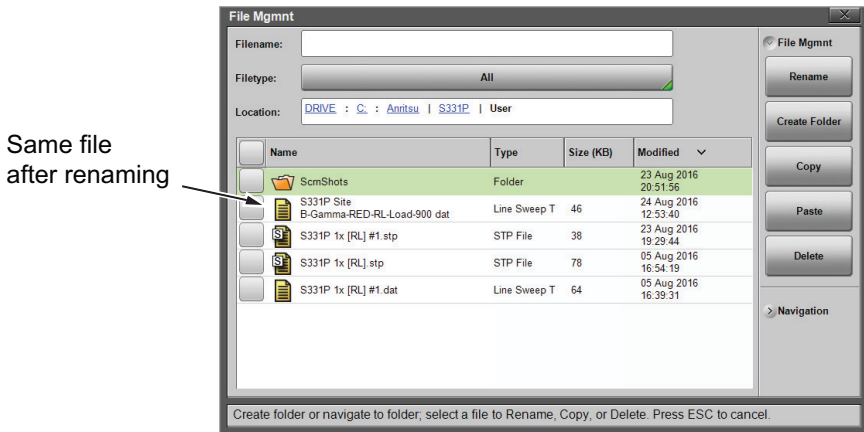


Figure 6-15. Renamed File

6-7 Copy and Paste File

The Site Master S331P allows multiple files and folders to be copied or moved at the same time. The example below describes how to copy or move files and folders from local disk on the controller device (tablet or PC) to a USB storage drive.

Note For user convenience, the Create Folder, Copy, Paste, and Delete buttons are available under each of the File Mgmnt, Recall, and File Save (not Save) submenus.

1. Press the **File** (1) key to display the File menu.
2. Press File Mgmnt to open the File Mgmnt dialog box.
3. Navigate to the file you wish to copy or move and press the checkbox next to it to select. Use the Navigation submenu keys as needed to move through a long list of files.

You can select a single or multiple files and folders, as illustrated in [Figure 6-16](#). Press the top checkbox to select all files and folders in the current directory.

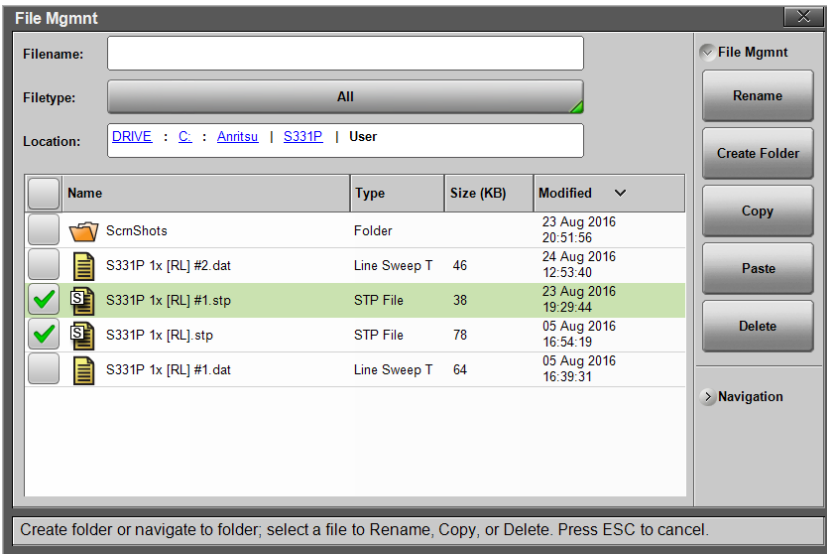


Figure 6-16. Multiple Item Selection

4. Under File Mgmt, press Copy. Touch OK in the confirmation message box.
5. Insert a USB storage drive into a USB port on the tablet or PC. (The destination folder is on a removable disk in this example.)
6. Double-tap Drive: in the Location directory path, then select the removable disk and open or create the destination folder.
7. Press Paste. In the Paste Selection prompt that opens, press Yes to move the selected file or files, No to copy.

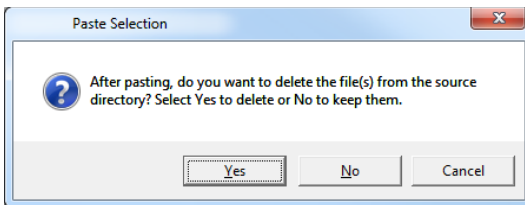


Figure 6-17. Paste Selection

- 8. If a file with the same name already exists in the destination folder, an overwrite confirmation prompt is displayed. Press Yes or No as appropriate.

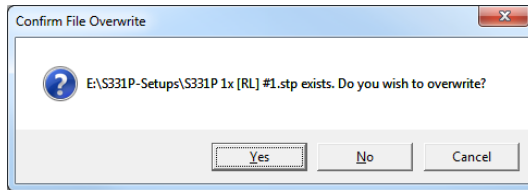


Figure 6-18. Confirm File Overwrite

Figure 6-19 shows the pasted files in the destination folder.

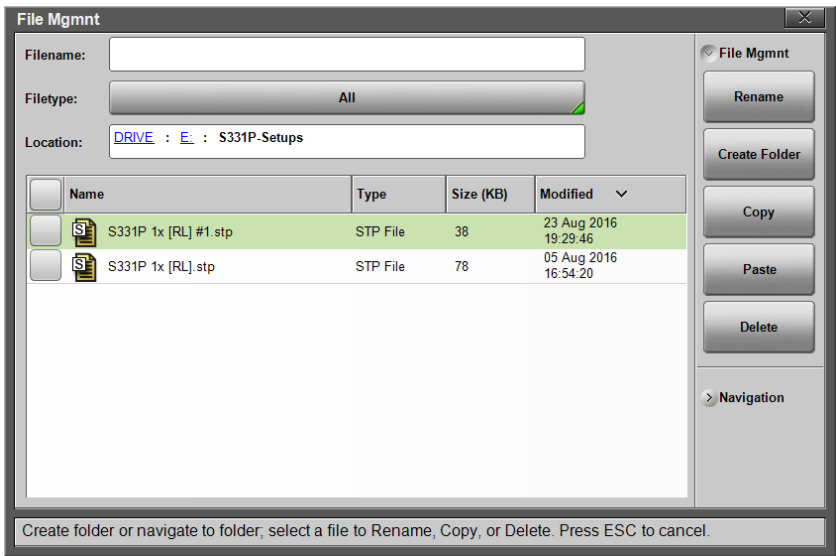


Figure 6-19. Pasted Files in Destination Folder

6-9 Create Folder

The Site Master S331P allows folders to be created on the controller device local disk or on a removable storage drive. This functionality is helpful in organizing traces by date, technician, carrier, and/or site location.

1. Press the **File** (1) key to display the File menu.
2. Press File Mgmnt to open the File Mgmnt dialog box.
3. Navigate to the location where you want to create the new folder.

Note

Double-tap a folder to open it. You can also use the Right and Left keys on the keypad pane to open and close folders.

4. Under File Mgmnt, press Create Folder to open the Foldername edit box and on-screen keyboard.
5. Enter the new folder name. Optionally, you can use the EZ Name keyboards to enter preset character strings. Refer to [“EZ Name Keyboards” on page 6-4](#).

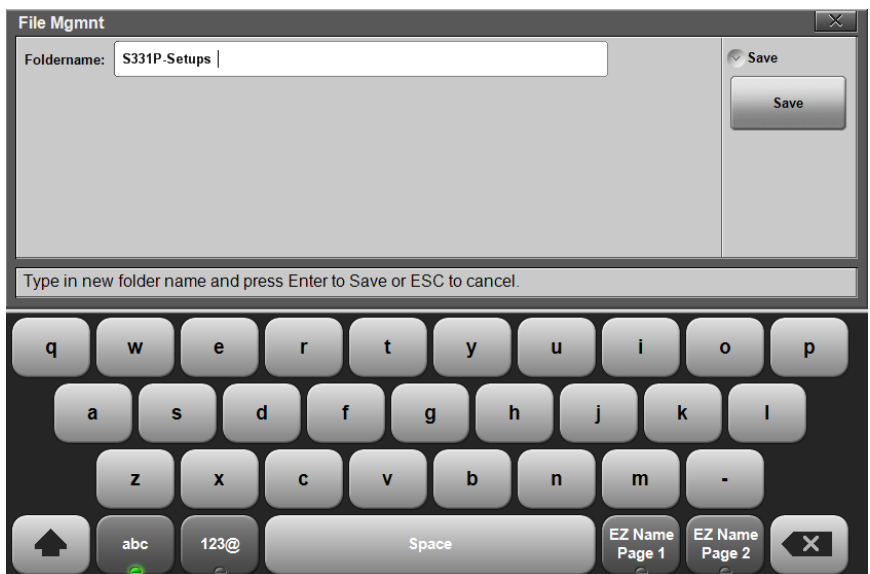


Figure 6-21. Enter a New Folder Name

6. Press **Save** to apply the new folder name and return to the File Mgmt dialog box.

Figure 6-22 illustrates the new folder S331P-Setups created on removable drive E:.

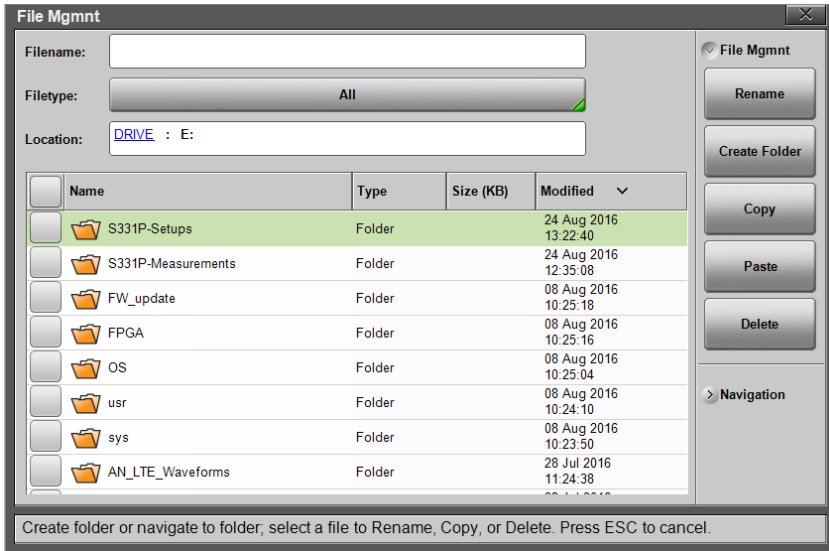


Figure 6-22. New Folder Created

6-10 File Menu Overview

Figure 6-23 shows the map of the File menus and submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.

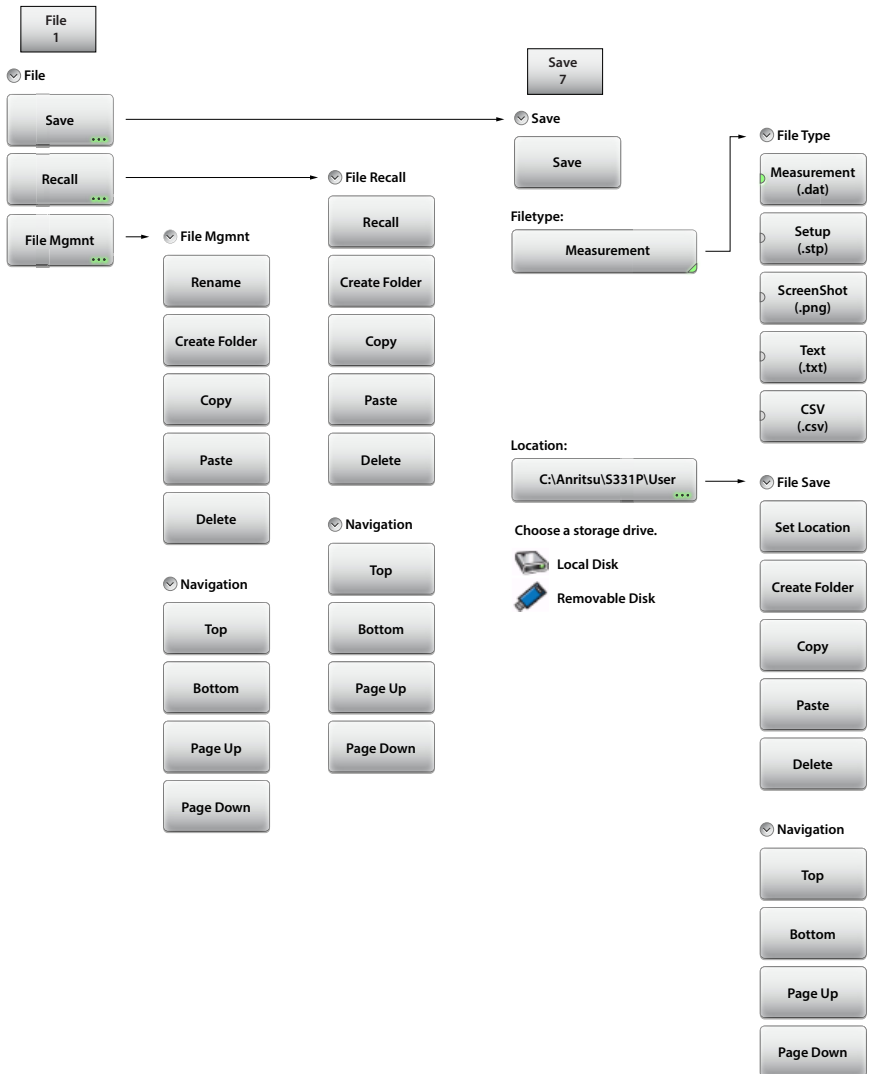


Figure 6-23. File Menu Map

6-11 File Menu

Key Sequence: **File** (1)

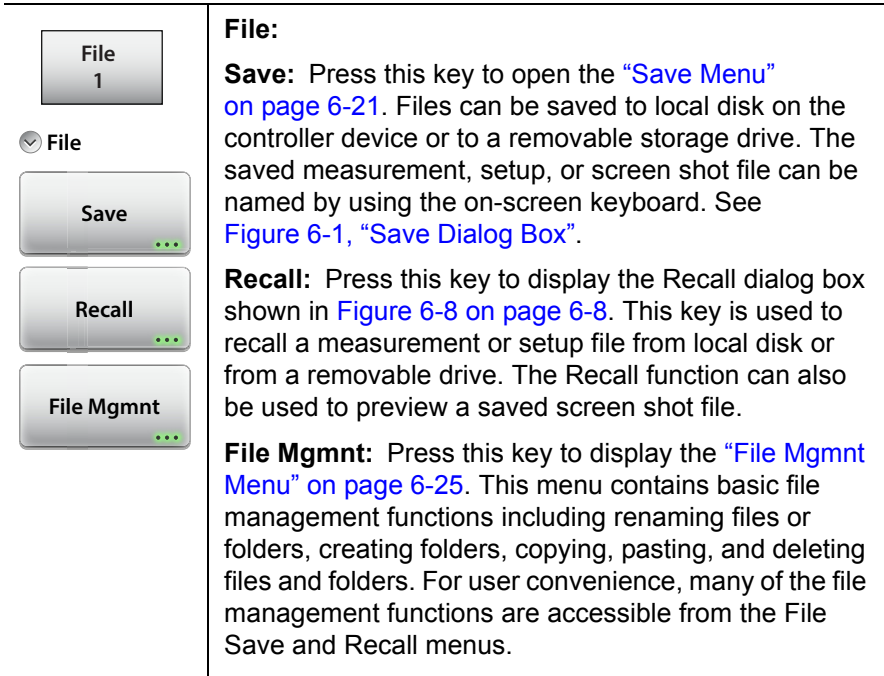


Figure 6-24. File Menu

Save Menu

Key Sequence: **File** (1) > **Save** or **Save** (7)

The screenshot shows the 'Save' menu with the following elements:

- A 'Save' button with the number '7' below it.
- A dropdown arrow next to the word 'Save'.
- A 'Save' button.
- The label 'Filetype:' followed by a 'Measurement' button.
- A dropdown arrow next to the text 'File Type' with an arrow pointing to the 'Measurement' button.
- A list of file type options: 'Measurement (.dat)', 'Setup (.stp)', 'ScreenShot (.png)', 'Text (.txt)', and 'CSV (.csv)'. Each option is in a button with a small circle on the left side.
- The label 'Location:' followed by a text box containing 'C:\Anritsu\S331P\User' and three dots on the right.
- The text 'Choose a storage drive.' with an arrow pointing to the 'Local Disk' and 'Removable Disk' options.
- Icons for 'Local Disk' (hard drive) and 'Removable Disk' (USB drive).

Save:

Save: Press this key to save the current measurement data, setup data, or screen.

Filetype: Press this key to select the type of data to save. Refer to “File Type” on page 6-6.

Measurement (.dat): Measurement files contain the measurement data and setup data.

Setup (.stp): Setup files contain basic instrument information, measurement setup details, measurement marker data, and limit data.

ScreenShot (.png): Screen shot files contain an image capture of the current interface display. Capture settings are set in the “Display Settings” on page 7-9.

Text (.txt): Saved instrument status and self-test results are stored in text files.

CSV (.csv): CSV files contain saved data in text format with Comma Separated Values (CSV).

Location: The Location button displays the current save location. Press this button to change the location where the Site Master saves files. Double-tap a folder to open it, and press Set Location under the File Save submenu to set the current open folder as the save destination. See Figure 6-6 on page 6-7. To cancel without making a change, press **Esc**.

Figure 6-25. Save Menu (1 of 2)

<p>Location:</p> <p>C:\Anritsu\S331P\User</p> <p>Choose a storage drive.</p> <p>Local Disk</p> <p>Removable Disk</p> <p>File Save</p> <p>Set Location</p> <p>Create Folder</p> <p>Copy</p> <p>Paste</p> <p>Delete</p> <p>Navigation</p> <p>Top</p> <p>Bottom</p> <p>Page Up</p> <p>Page Down</p>	<p>File Save:</p> <p>Set Location: Press this key to set the current open folder as the location for saving files. Refer to “Save Location” on page 6-7.</p> <p>Create Folder: Press this key to create a new folder in the current location. Name the new folder with the on-screen keyboard and press Save. Refer to “Create Folder” on page 6-17.</p> <p>Copy: Press this key to mark the selected files and folders for subsequent copying or moving, using the Paste key. Refer to “Copy and Paste File” on page 6-13.</p> <p>Paste: Press this key to paste the selected files and folders to the destination location. In the message box that appears (see Figure 6-17 on page 6-14), press No to create duplicate copies in the destination folder; press Yes to place copies in the destination folder and remove the selected files from the source location. If files or folders with the same name already exist in the destination location, a prompt will ask you to confirm that the existing files should be overwritten.</p> <p>Delete: Press this key to delete the selected (check marked) files and folders. Only files and folders from the same location can be deleted together.</p> <p>Once an item is deleted, it cannot be recovered.</p> <p>Navigation:</p> <p>Top: Press this key to navigate to the top item of the current location.</p> <p>Bottom: Press this key to navigate to the bottom item of the current location.</p> <p>Page Up: Moves up one screen of items in the current location.</p> <p>Page Down: Moves down one screen of items in the current location.</p>
--	---

Figure 6-25. Save Menu (2 of 2)

Recall Menu

Key Sequence: **File (1) > Recall**

<p> <input type="radio"/> File Recall </p> <p> <input type="button" value="Recall"/> </p> <p> <input type="button" value="Create Folder"/> </p> <p> <input type="button" value="Copy"/> </p> <p> <input type="button" value="Paste"/> </p> <p> <input type="button" value="Delete"/> </p> <hr/> <p> <input type="radio"/> Navigation </p>	<p>File Recall:</p> <p>Recall: Press this key to recall the selected file. Measurements, setups, or screen shots can be recalled.</p> <p>Recalled measurements are first displayed on the screen interface as a preview. Press Enter to complete recalling the measurement or press ESC to cancel the recall and return to the File Recall menu. Refer to “Recall File” on page 6-8 for more information.</p> <p>Recalled setups change the current setup including measurement type, frequency/distance, amplitude, marker, and limit data.</p> <p>Recalled screen shots are displayed as previews. Press ESC to return to the File Recall menu.</p> <p>Create Folder: Press this key to create a new folder in the current location. Name the new folder with the on-screen keyboard and press Save. Refer to “Create Folder” on page 6-17.</p> <p>Copy: Press this key to mark the selected files and folders for subsequent copying or moving, using the Paste key. Refer to “Copy and Paste File” on page 6-13.</p> <p>Paste: Press this key to paste the selected files and folders to the destination location. In the message box that appears (see Figure 6-17 on page 6-14), press No to create duplicate copies in the destination folder; press Yes to place copies in the destination folder and remove the selected files from the source location. If files or folders with the same name already exist in the destination location, a prompt will ask you to confirm that the existing files should be overwritten.</p> <p>Delete: Press this key to delete the selected (check marked) files and folders. Only files and folders from the same location can be deleted together.</p> <p>Once an item is deleted, it cannot be recovered.</p>
---	---

Figure 6-26. Recall Menu (1 of 2)

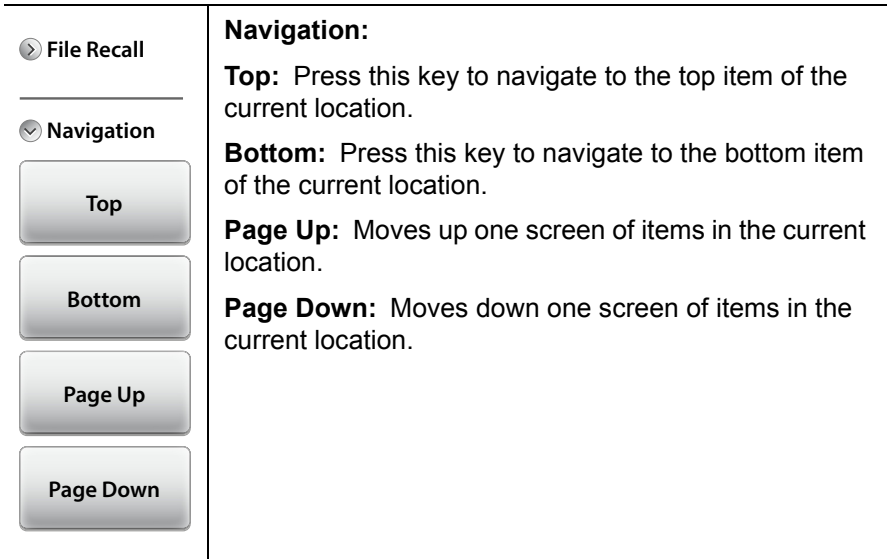


Figure 6-26. Recall Menu (2 of 2)

File Mgmt Menu

Key Sequence: **File** (1) > File Mgmt

<p>File Mgmt</p> <p>Rename</p> <p>Create Folder</p> <p>Copy</p> <p>Paste</p> <p>Delete</p>	<p>File Mgmt: You can choose to display only files of a specific type, or all files contained in the current location. To select the file type, press the Filetype button, then the desired file type key. See Figure 6-28.</p> <p>Rename: Press this key to rename the selected file or folder. The current name is displayed for editing or appending. Press Save or Enter to complete. Refer to “Rename File” on page 6-12.</p> <p>Create Folder: Press this key to create a new folder in the current location. Name the new folder with the on-screen keyboard and press Save. Refer to “Create Folder” on page 6-17.</p> <p>Copy: Press this key to mark the selected files and folders for subsequent copying or moving, using the Paste key. Refer to “Copy and Paste File” on page 6-13.</p> <p>Paste: Press this key to paste the selected files and folders to the destination location. In the message box that appears (see Figure 6-17 on page 6-14), press No to create duplicate copies in the destination folder; press Yes to place copies in the destination folder and remove the selected files from the source location. If files or folders with the same name already exist in the destination location, a prompt will ask you to confirm that the existing files should be overwritten.</p> <p>Delete: Press this key to delete the selected (check marked) files and folders. Only files and folders from the same location can be deleted together. Once an item is deleted, it cannot be recovered.</p> <p>Navigation:</p> <p>Top: Skips to the top item of the current location.</p> <p>Bottom: Skips to the bottom item of the current location.</p> <p>Page Up: Moves up one screen of items in the current location.</p> <p>Page Down: Moves down one screen of items in the current location.</p>
<p>Navigation</p> <p>Top</p> <p>Bottom</p> <p>Page Up</p> <p>Page Down</p>	

Figure 6-27. File Mgmt Menu

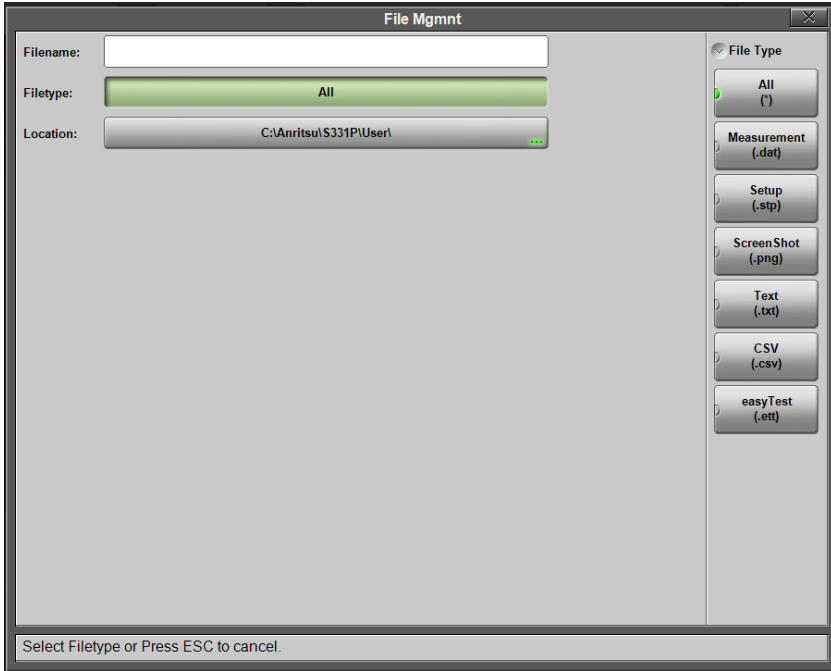



Figure 6-28. File Type Selection in File Management

Chapter 7 — System Operations

7-1 Introduction

This chapter describes the Site Master system operations and related menus. To access the System functions, press the **System** (8) key on the interface keypad. The chapter also covers the interface screen capture function and the instrument's Help feature.

7-2 Screen Shot Capture

You can capture and save a bit mapped image of the Site Master interface screen by pressing the **ScrnShot** (4) key or the Camera icon, .

The file is automatically named based on the instrument model, measurement type, and current date and time. By default, screen shot files are saved to the folder C:\Anritsu\S331P\User\ScrnShots on the tablet or PC.

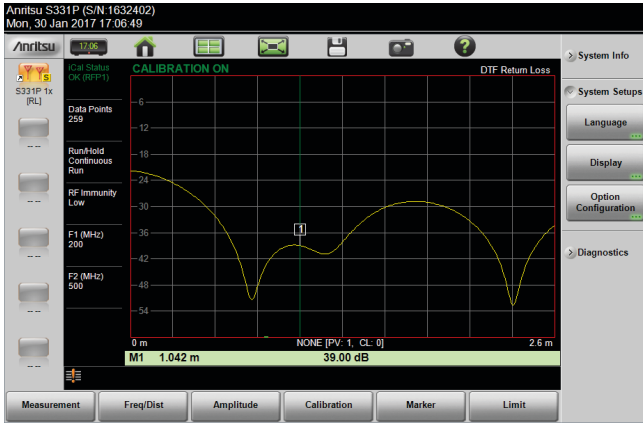
Note

Display screens can also be captured by pressing the **Save** (7) key or the Save icon in the top tool bar, then setting the Filetype to ScreenShot. Using the **Save** (7) key or the Save shortcut icon gives you the option of specifying the file name and destination location instead of applying the defaults. Refer to [Chapter 6](#) for additional information.

The appearance of the saved screen shot can be specified by following this key sequence:

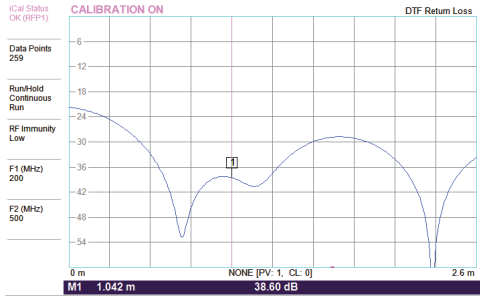
System (8) > System Setups > Display/Audio > ScrnShot Settings

Refer to “[Display Settings](#)” on [page 7-9](#) for details. [Figure 7-1 on page 7-2](#) shows examples of the same measurement saved with different screen shot settings.



Settings:

Image Capture Size: Full Screen
 Background Color: Standard
 Image Header/Footer: Header



Anritsu S331P (S/N:1632402)
 Mon, 30 Jan 2017 17:07:29

Settings:

Image Capture Size: Graph Only
 Background Color: Inverted
 Image Header/Footer: Footer

Figure 7-1. Screen Shot Examples

7-3 Help

Key Sequence: **Help** (0)

Press one of the tabs at the bottom of the main Help Screen to view information about the Site Master status, Frequently Asked Questions, or the instrument User Guide (see [Figure 7-2](#)).

You can also access the Help feature by pressing the Help icon in the [“System Function Tool Bar”](#) at the top of the screen.

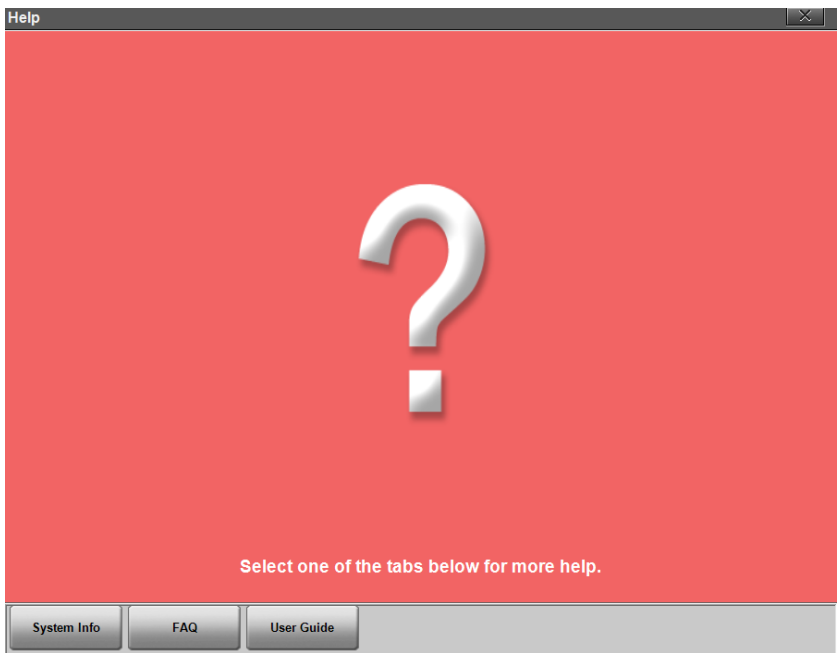


Figure 7-2. Main Help Screen

Press the **System Info** tab on the main Help screen to display information on the Site Master instrument and software version.

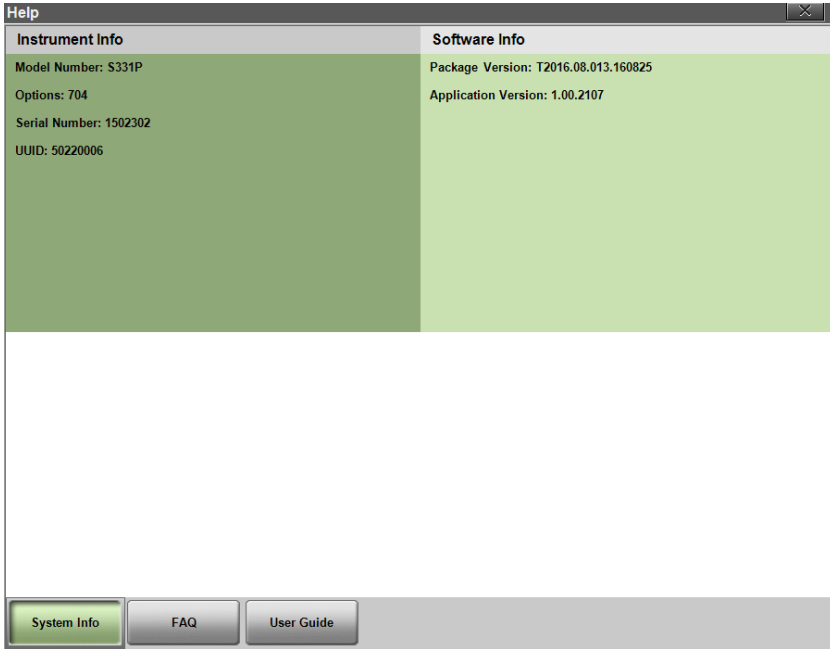


Figure 7-3. System Info

Press **Esc** or  to exit Help.

Pressing the **FAQ** tab on the main Help screen opens a new browser page where you can view answers to frequently asked questions.


Press the **User Guide** tab to view a browser-based version of this manual.

7-4 Self Test

To start the instrument self test:

1. Press the **System** (8) key on the interface screen keypad.
2. Press the **Diagnostics** submenu, then **Self Test**. The test will start and results are displayed in the Self Test window (see [Figure 7-4](#)).
3. If needed, use the page control keys to scroll up and down the test results window.
4. To save the test results, press **Save to File**.

A text file with the default name S331PSelf Test #X.txt is created, where X is a sequential number that increments each time a file is saved. The default location of the file is C:\Anritsu\S331P\User on your tablet or PC.

5. Press **Esc** or  to close the Self Test window.

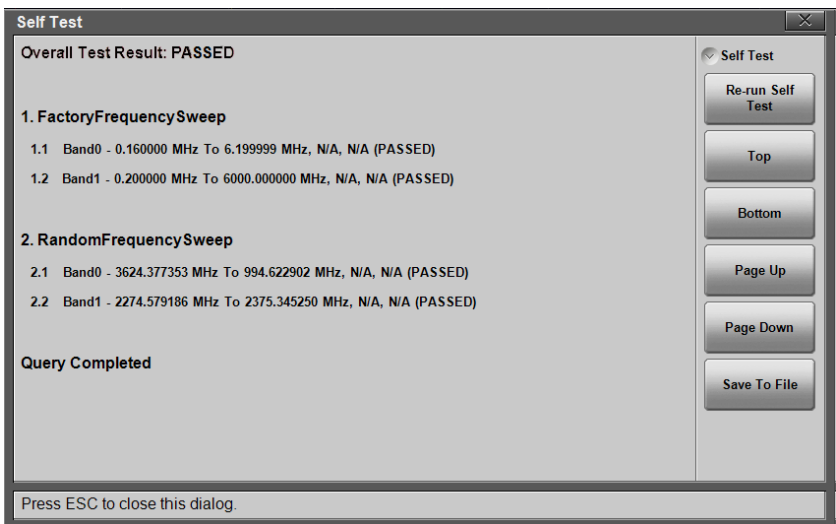


Figure 7-4. Self Test Window

7-5 System Menu Overview

Figure 7-5 illustrates the menu map of the Site Master System functions.

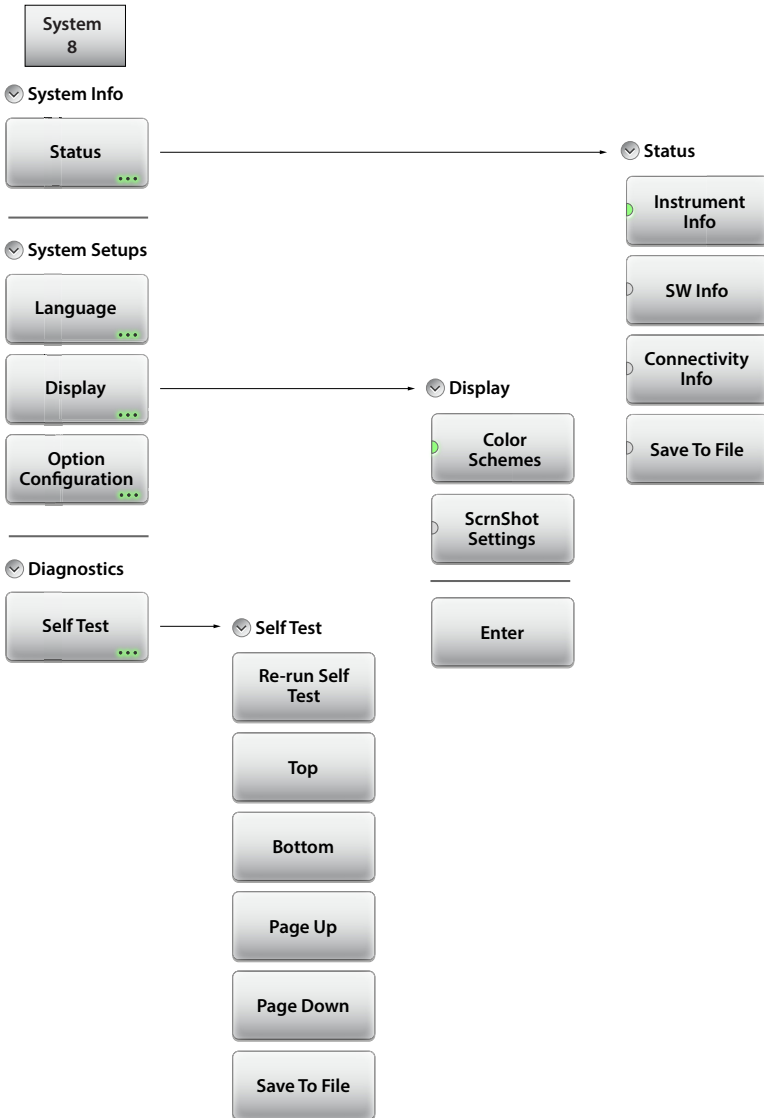



Figure 7-5. System Menu Map

7-6 System Menu

Key Sequence: **System** (8)



The screenshot shows a vertical menu on the left side of a screen. At the top is a button labeled 'System 8'. Below it are four main menu items, each with a dropdown arrow and a '...' icon: 'System Info', 'System Setup', 'Option Configuration', and 'Diagnostics'. Under 'System Info' are buttons for 'Status', 'Language', 'Display', and 'Option Configuration'. Under 'Diagnostics' is a button for 'Self Test'. The right side of the screen contains text descriptions for each of these sub-menus.

System Info:

Status: Press this submenu key to open the Status dialog box, where you can view information on the Site Master instrument, its firmware version, and connectivity information. Refer to [“Status Menu” on page 7-8](#).

System Setup:

Language: Press this key to select the interface language. Options include: English, French, German, Italian, Spanish, Russian, Portuguese, Japanese, Korean, or Chinese.

Display: Press this submenu key to access [“Display Settings” on page 7-9](#), which include color schemes and screen shot settings.

Option Configuration: Press this key to view what options are installed, such as Option 704 (150 kHz to 4 GHz) or Option 706 (150 kHz to 6 GHz).

Diagnostics:

Self Test: Press this submenu key to initiate diagnostic tests on the instrument. Test results are listed in the Self Test window, illustrated in [Figure 7-4 on page 7-5](#). Press **Esc** to close the window.

Press Save to File to save the results in a text file. The file will be named S331PSelf Test #X.txt, where X is an automatically generated sequence number. The default location of the file is C:\Anritsu\S331P\User on your tablet or PC.

Figure 7-6. System Menu

Status Menu

Key Sequence: **System** (8) > System Info > Status

<p>▼ Status</p> <p>Instrument Info</p> <p>SW Info</p> <p>Connectivity Info</p> <p>Save To File</p>	<p>Status:</p> <p>Instrument Info: Displays the instrument model, serial number, and installed options.</p> <p>SW Info: Press this submenu key to display the version of various software components.</p> <p>Connectivity Info: Press this key to view the IP address of the controller device (tablet or PC).</p> <p>Save to File: Press Save to File to create a text file of the instrument status. The file will be named S331PStatus #X.txt, where X is an automatically generated sequence number. The default location of the file is C:\Anritsu\S331P\User on your tablet or PC.</p>
--	---

Figure 7-7. Status Menu

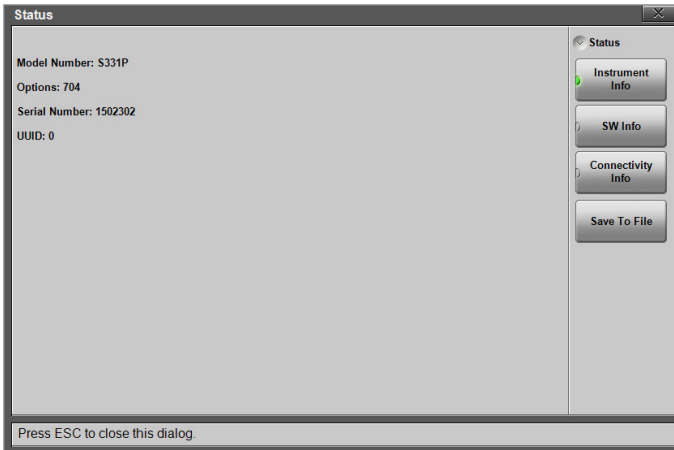


Figure 7-8. System Status Dialog Box

Display Settings

Key Sequence: **System (8)** > System Setups > Display

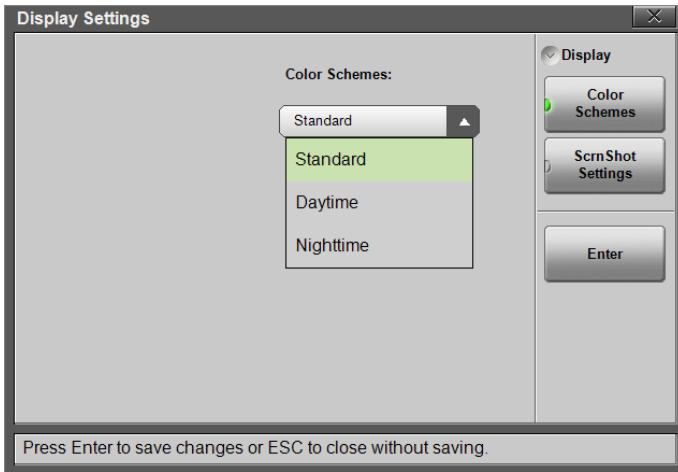


Figure 7-9. Display Settings - Color Schemes

<p>☑ Display</p> <p>Color Schemes</p> <p>ScrnShot Settings</p> <p>Enter</p>	<p>Color Schemes: Press this key and use the pull-down menu to select Standard, Daytime, or Nighttime color scheme. See Figure 7-9.</p> <p>Standard is the default display mode, suitable for normal lighting conditions.</p> <p>Daytime is used for challenging daytime viewing conditions requiring increased contrast.</p> <p>Nighttime is optimized for nighttime viewing with a darker, red-tinted color scheme.</p>
---	--

Figure 7-10. Display Menu (1 of 2)


<p>Display</p> <p>Color Schemes</p> <p>ScrnShot Settings</p> <p>Enter</p>	<p>ScrnShot Settings: Press this key to change the settings used when capturing a screen shot with the ScrnShot (4) key or the  icon.</p> <p>Under Image Capture Size, press the pull-down menu and select Graph Only or Full Screen, which captures the entire interface screen including menu keys and user-defined shortcuts.</p> <p>Under Background Color, press the pull-down menu and select Inverted to remove the graph background color (useful for paper printing) or select Standard for the typical black background.</p> <p>Choose Image Header or Footer from the pull-down menu to have the instrument information and date stamp displayed at the top or bottom of the captured image.</p> <p>Enter: Press Enter to apply the settings. Pressing Esc closes the Display Settings window without applying changes.</p>
---	--

Figure 7-10. Display Menu (2 of 2)

7-7 Preset Menu

Key Sequence: **Preset** (9)

Note Carefully read the on-screen information before performing any of the functions under the Preset menu. User files that are deleted cannot be recovered.

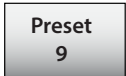


 <input checked="" type="checkbox"/> Preset  <hr/> <input checked="" type="checkbox"/> Reset 	<p>Preset:</p> <p>Preset: Press this key to reset the instrument to default conditions:</p> <ul style="list-style-type: none">Return Loss measurementfull frequency rangefull amplitude scalecalibration offall markers offlimit lines off <p>Reset:</p> <p>Reset: Press this key to open the Reset Setup window, where you can choose the type of reset to perform. Carefully read the on-screen information before confirming the reset. Press ESC to cancel and close.</p> <p>Factory Reset: Applies factory default settings for all measurement modes and application settings, including language, color scheme, and screen shot settings. This action also exits the S331P application.</p> <p>Delete All User Files: Deletes all user files and folders in C:\Anritsu\S331P\User. This includes measurement, setup, and screen shot files. Menu shortcuts, customized EZ key names, and custom cable types are not deleted.</p> <p>The ScrnShots subdirectory will be created automatically the next time you capture the interface screen using the Camera icon or the ScrnShot (4) key.</p>
---	--

Figure 7-11. Preset Menu (1 of 2)

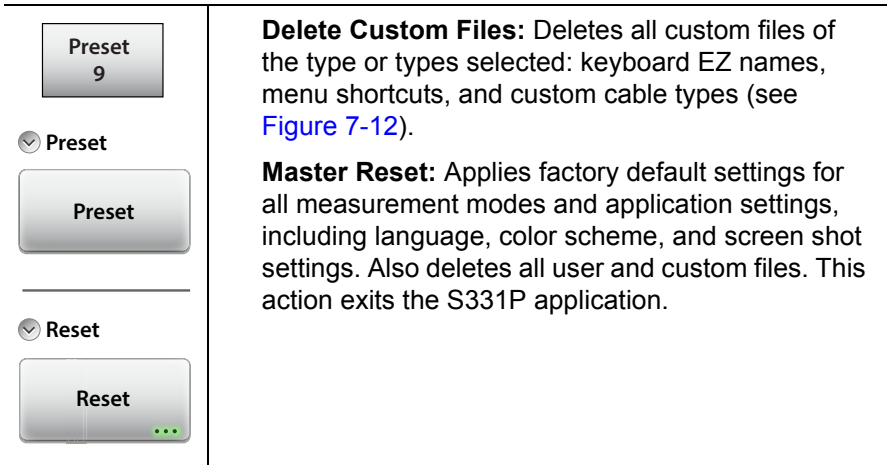


Figure 7-11. Preset Menu (2 of 2)

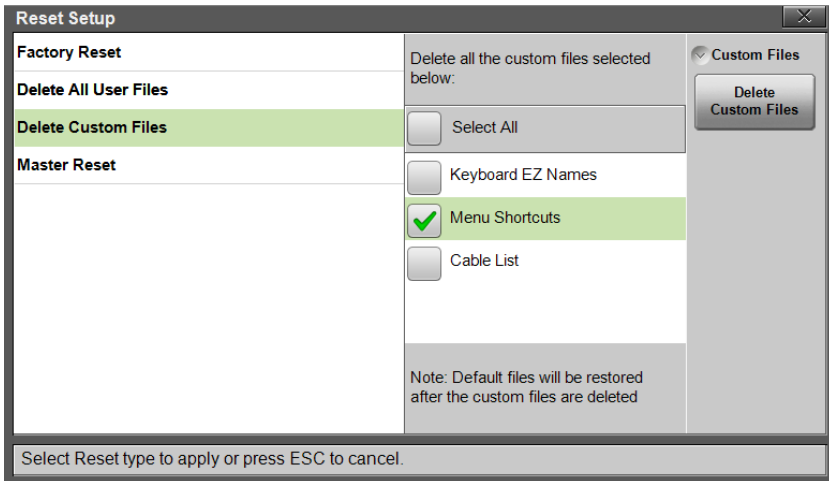


Figure 7-12. Delete Custom Files

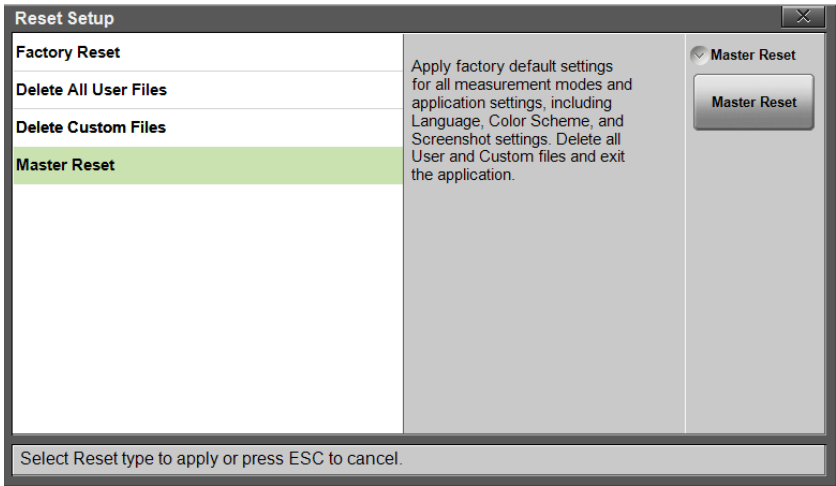


Figure 7-13. Master Reset

Chapter 8 — Anritsu Tool Box

8-1 Introduction

The Anritsu Tool Box is a suite of applications designed to improve productivity for people who work with large numbers of cable and antenna traces every day.

This chapter gives an overview of the top features and functions of the Line Sweep Tools and easyTest Tools. For a detailed description of these features and how to perform specific tasks, refer to each application's Help system.

8-2 Line Sweep Tools (LST)

Line Sweep Tools is post-capture trace processing software intended for users who need to analyze and generate reports on large numbers of cable and antenna traces. Software features include the following:


- Presets for markers and limit lines take hours off the report preparation time for a user with dozens of traces to verify.
- Easily convert Return Loss or VSWR traces to Distance-to-Fault (DTF) traces.
- A Measurement Calculator provides quick conversion between commonly used measurement units such as VSWR or RL.
- A Cable Editor lets you retrieve the cable list from instrument and modify as required.
- Signal standard list can also be retrieved from instrument and modified as needed.
- A naming grid function makes changing file names and trace titles and subtitles much quicker and error free.
- The Report Generator makes generating PDF or HTML-based reports for multiple traces quick and easy.

8-3 easyTest Tools

easyTest Tools is used to create work instruction files that consist of a command sequence and instructions to help less experienced personnel with operating the instrument in the field.

- A drag-and-drop tool facilitates the creation of test scripts from a library of commands.
- Instructions can be a mix of text prompts and custom user images that may include connection diagrams or procedure steps.
- Recall Setup command lets you specify a particular setup, placing the instrument in a known state by retrieving saved parameters such as measurement type, frequency and amplitude settings, markers and limit lines.
- Measurements or screen shots can be saved automatically or manually.

To recall an easyTest file:

1. Press **Menu** on the S331P interface screen.
2. Press the easyTest  icon on the Menu Shortcut window.
3. In the easyTest Recall dialog, select the .ett file and press **Recall**.

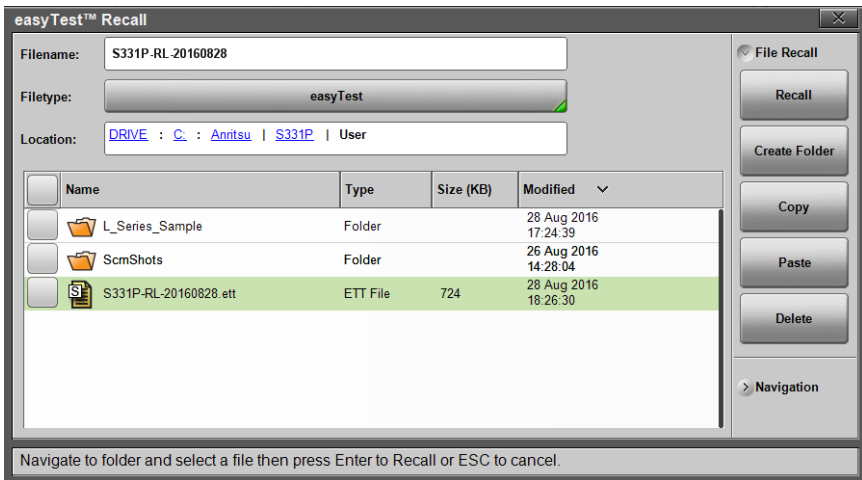


Figure 8-1. easyTest Recall Dialog Box

4. Press **Next** to move to the next instruction screen. To abort the easyTest sequence, press **Esc**.

Appendix A — Glossary of Terms

A-1 Introduction

The following terms are used in this manual or are relevant to the topics discussed.

A-2 Glossary Terms

3 dB rule : The 3 dB rule provides a means to estimate relative power values. A 3 dB gain indicates that power increases to twice the power (a multiple of 2). A 3 dB loss indicates that power decreases to half the power (a multiple of 1/2). A system with 40 watts of input power and a 6 dB insertion loss will have only 10†watts of output power (a multiple of 1/2 for each 3 dB loss, or 1/4 of 40 watts).

Adapter : A fitting that supplies a passage between two sets of equipment when they cannot be directly interconnected.

Adaptive Array

Antenna : Adaptive array antenna is a type of advanced 'smart' antenna technology that continually monitors a received signal and dynamically adapts signal patterns to optimize wireless system performance. The arrays use signal processing algorithms to adapt to user movement, to changes in the radio-frequency environment, and to multi-path and co-channel interference.

ADC : Analog-to-Digital Converter (ADC, A/D or A to D) is an electronic device that converts continuous signals to discrete digital numbers. The reverse operation is performed by a digital-to-analog converter (DAC). ADC can uniquely represent all analog input values within a specified total input range by a limited number of digital output codes. Refer also to DAC.

Analog System : An Analog system uses an analog transmission method to send voice, video and data-using analog signals, such as electricity or sound waves, that are continuously variable rather than discrete units as in digital transmissions. Mobile analog systems include AMPS, NMT and ETACS.

Analog

Transmission : Analog Transmission refers to signals propagated through the medium as continuously varying electromagnetic waves.

Antenna : Antenna is a device which radiates and/or receives radio signals, including RF, microwave, and RADAR.

Antenna

beamwidth : Antenna beamwidth, also known as the half-power beamwidth, is the angle of an antenna pattern or beam over which the relative power is at or above 50% of the peak power.

Antenna Directivity : Antenna directivity, also known as antenna gain, is the relative gain of the main beam of an antenna pattern to a reference antenna, usually an isotropic or standard dipole. Antenna Directivity is the percentage of radiated signal transmitted or received in a given direction related to beamwidth.

Antenna Efficiency : Antenna Efficiency is the percentage of theoretical gain actually realized from an antenna.

Antenna Gain : Antenna gain, also known as antenna directivity, is the relative gain of the main beam of an antenna pattern to a reference antenna, usually an isotropic or standard dipole. Antenna Gain is the effectiveness of a directional antenna expressed as the ratio of input power of the directional antenna to input power of an isotropic radiator to provide the same field strength in the desired direction. Sometimes related to a dipole antenna.

Antenna, Isotropic : An isotropic antenna is a theoretical point source radiating a spherical power envelope.

Antenna, Parabolic : A parabolic antenna is an antenna utilizing a reflector that is shaped as a paraboloid in order to both concentrate the radiated signal into a beam and to provide considerable gain. Beamwidth varies inversely and gain varies directly with the size of the antenna and with frequency.

Attenuation : Attenuation refers to decreasing in signal magnitude between two points. These points may be along a radio path, transmission line or other devices.

Attenuator : Attenuator is a device specifically designed to decrease the magnitude of a signal transmitted through it.

- Average power :** Average power is the peak power averaged over time and is usually applied to pulsed systems where the carrier power is switched on and off.
- Backhaul :** In wireless technology, backhaul refers to transporting voice and data traffic from a cell site to the switch.
- Band Pass Filter :** A Band Pass Filter is a radio wave filter with a specific range of frequencies in which it is designed to pass. It rejects frequencies outside the pass-band range. A resistor-inductor-capacitor circuit is an example of a Band Pass Filter.
- Bandwidth :** Bandwidth usually identifies the capacity of a circuit or amount of data that can be sent through a given circuit. It may be user-specified in a PVC. It is an indication of the amount of data that is passing over a medium. Also, bandwidth is the portion of the frequency spectrum required to transmit desired information. Each radio channel has a center frequency and additional frequencies above and below this carrier frequency which is used to carry the transmitted information. The range of frequencies from the lowest to the highest used is called the bandwidth.
- Bandwidth Ratio :** Bandwidth Ratio is the ratio of two devices having differing bandwidths, not necessarily in the same frequency spectrum.

BER : Bit Error Rate or Bit Error Ratio (link quality specification/testing) (BER) is a measure of transmission quality. The ratio of error bits to the total number of bits transmitted. A bit error rate of 10^{-6} refers to an average of one error per million bits. It is generally shown as a negative exponent, (for example, 10^{-7} which means 1 out of 10^7 bits are in error or 1 out of 10,000,000 bits are in error). Bit Error Rate is the fraction of a sequence of message bits that are in error.

BERT : Bit Error Rate Test/Tester (BERT) is a test that gauges the quality of the T1 or digital line. By sending a known pattern to another device across the span, the far end device can compare incoming pattern to its own, thereby indicating bit errors on the line.

Broadband : Broadband refers to telecommunication that provides multiple channels of data over a single communications medium, typically using some form of frequency or wave division multiplexing. It is a service or system requiring transmission channels capable of supporting rates greater than the Integrated Services Digital Network (ISDN) primary rate.

Calibration : When making measurements, the instrument must be calibrated in order to remove residual errors due to measurement setup conditions. Anritsu recommends performing the calibration under the same conditions as the measurement: temperature, frequency, number of points, source power, and IFBW. Calibrations standards with known reflection coefficients are used to calculate the correction factors. The calibration must be conducted using the appropriate standards at the open end of any test port cables and adapters that are connected to the instrument. This ensures that the match, phase length, and loss of these cables and adapters are all accounted for. For optimal performance, high quality phase-stable cables and precision adapters must be used.

CCDF : Complementary Cumulative Distribution Function (CCDF) is a method used to characterize the peak power statistics of a digitally modulated signal. The CCDF curve can be used to determine design parameters for CDMA systems (such as the amount of back-off to run in a power amplifier).

Cell : In wireless communication, a Cell is the geographic area encompassing the signal range from one base station (a site containing a radio transmitter/receiver and network communication equipment). Wireless transmission networks are composed of many hexagonal, overlapping cell sites to efficiently use radio spectrum for wireless transmissions. Also, cell is the basis for the term 'cellular phone.'

Cell Delineation : Cell Delineation is the process for recognizing the beginning and end of ATM cells within the raw serial bit stream.

Cell Site : Cell Site, also called Base Station, is the local cellular tower and radio antenna (including the radios, controller, switch interconnect, etc.) that handles communication with subscribers in a particular area or cell. A cellular network is made up of many cell sites, all connected back to the switch via landline or microwave.

Cellular : In wireless communications, cellular refers most basically to the structure of the wireless transmission networks which are comprised of cells or transmission sites. Cellular is also the name of the wireless telephone system originally developed by Bell Laboratories that used low-powered analog radio equipment to transmit within cells. The terms 'cellular phone' or 'cell phone' are used interchangeably to refer to wireless phones. Within the wireless industry, cellular is also used to refer to non-PCS products and services.

Coaxial Cable : Coaxial Cable (Coax) is a type of electrical communications medium used in the LAN environment. This cable consists of an outer conductor concentric to an inner conductor, separated from each other by insulating material, and covered by some protective outer material. This medium offers large bandwidth, supporting high data rates with high immunity to electrical interference and a low incidence of errors. Coax is subject to distance limitations and is relatively expensive and difficult to install.

Configuration

Commands : Configuration Commands are commands that are issued to an instrument and that change a specific instrument configuration.

COW : Cell site On Wheels (COW) is a mobile site placed at a location to fill in or increase coverage.

CPLT : Cell Site on Light Truck (CPLT) is a mobile site on a vehicle placed at a location to fill in or increase coverage.

CPM : Continuous Phase Modulation (CPM) is a phase modulation technique employing smooth transitions between signal states. This reduces sidelobe spectral energy and improves co-channel performance.

CW : Continuous Wave (CW)

DANL : Displayed Average Noise Level (DANL): Displayed average noise level is sometimes confused with the term Sensitivity. While related, these terms have different meanings. Sensitivity is a measure of the minimum signal level that yields a defined signal-to-noise ratio (SNR) or bit error rate (BER). It is a common metric of radio receiver performance. Spectrum analyzer specifications are always given in terms of the DANL. One of the primary uses of a spectrum analyzer is to search out and measure low-level signals. The limitation in these measurements is the noise generated within the spectrum analyzer itself. This noise, generated by the random electron motion in various circuit elements, is amplified by multiple gain stages in the analyzer and appears on the display as a noise signal. On a spectrum analyzer, this noise is commonly referred to as the Displayed Average Noise Level, or DANL 1. While there are techniques to measure signals slightly below the DANL, this noise power ultimately limits our ability to make measurements of low-level signals.

- dB** : Decibel or deciBel (dB) is a logarithmic ratio of the difference between two values (a logarithm ratio is equal to 10 times). dB is a unit for measuring relative power ratios in terms of gain or loss. The units of dB are expressed in terms of the logarithm to base 10 of a ratio and typically are expressed in watts. For example, a -3 dB loss indicates a 50% loss in power; a +3 dB reading is a doubling of power; 10 dB indicates an increase (or a loss) by a factor of 10; 20 dB indicates an increase (or a loss) of a factor of 100; 30 dB indicates an increase (or a loss) by a factor of 1000. Common values of dB expressed in ratios: 0 dB = 1:1, 10 dB = 10:1, 20 dB = 100:1, 30 dB = 1000:1, -30 dB = 0.001:1 [or (1/1000):1].
- dBc** : Decibels referenced to the carrier (dBc) is a technique for expressing a power measurement in logarithmic form using the carrier power as a reference. The units are used to describe how far down signals and noise are relative to a known signal. Typical use of this term is to describe spurious signals and noise compared to a desired transmit signal.
- dBd** : Decibels referenced to a dipole antenna (dBd) is a technique for expressing a power gain measurement in logarithmic form using a standard dipole antenna as a reference. dBd is a measurement of signal gain used in radio antenna design. Pecifically, dBd refers to signal gain in a dipole radiator.

dBm : dBm is an absolute measurement of power relative to 1 milliwatt. In other words, dBm is a decibel value referenced to a milliWatt (dBm). This is a technique for expressing a power measurement in logarithmic form using 1 mW as a reference. dBm is a decibel ratio (log 10) of Watts (W) to one milliwatt (1mW). dBm, therefore, represents absolute power. Examples are: 0 dBm = 1.0 milliwatt, 10 dBm = 10 milliwatt, 30 dBm = 1000 milliwatt = 1 watt.

DHCP : Dynamic Host Configuration Protocol (DHCP)

DSP : Digital Signal Processing (DSP)

DSRC : Dedicated Short Range Communications (DSRC): DSRC is a system that is intended for communications between two vehicles, or from one vehicle to a roadside network. Refer to IEEE 802.11p.

DTF : Distance-To-Fault (DTF) is the distance from the instrument output connector (or the end of a test lead) to a problem area, as indicated by a peak in the displayed signal. DTF measures the location and reflection size of impedance mismatches. This is typically a diagnostic measurement, not a pass/fail judgement measurement. DTF is used to identify and locate faults within an antenna system when the system is failing to meet the specified return loss or VSWR limits. DTF is also useful to verify the total length of a coaxial cable assembly.

- DVB-C : Digital Video Broadcasting - Cable (DVB-C), is the DVB European consortium standard for the broadcast transmission of digital television over cable. This system transmits an MPEG-2 family digital audio/video stream, using a QAM modulation with channel coding.
- DVB-H : Digital Video Broadcasting - Handheld (DVB-H) is a technical specification for bringing broadcast services to handheld receivers and was formally adopted as ETSI standard EN 302 304 in November, 2004. The major competitor of this technology is DMB (Digital Multimedia Broadcasting).
- DVB-S : Digital Video Broadcasting-Satellite (DVB-S) is the original Digital Video Broadcasting (DVB) forward error coding and modulation standard for satellite television and dates from 1995. It is used via satellites serving every continent of the world. DVB-S is used in both MCPC and SCPC modes for broadcast network feeds, as well as for direct broadcast satellite services like Sky TV (UK) via Astra in Europe, Dish Network in the U.S., and Bell ExpressVu in Canada. The transport stream delivered by DVB-S is mandated as MPEG-2.
- DVB-T : Digital Video Broadcasting - Terrestrial (DVB-T) is the DVB European consortium standard for the broadcast transmission of digital terrestrial television. This system transmits a compressed digital audio/video stream, using OFDM modulation with concatenated channel coding (COFDM). The adopted source coding methods are MPEG-2 and, more recently, H.264.

FFT : Fast Fourier Transform (FFT) is an efficient algorithm to compute the Discrete Fourier transform (DFT) and its inverse. FFTs are of great importance to a wide variety of applications, from digital signal processing to solving partial differential equations to algorithms for quickly multiplying large integers.

Flash Memory : Flash memory is a non-volatile solid state storage device that is packaged as a chip. It can be electrically erased and reprogrammed. It is primarily used in memory cards, USB flash drives, MP3 players, and solid-state drives for general storage and transfer of data between computers and other digital products. It is a specific type of EEPROM (electrically erasable programmable read-only memory) that is erased and programmed in large blocks.

FM : Frequency Modulation (FM) is a form of angle modulation in which the instantaneous frequency of a sine-wave carrier is caused to depart from the carrier frequency by an amount proportional to the instantaneous value of the modulating wave. In FM, signals of different frequencies represent different data values.

FM Modulation

Index : In FM modulated systems, the FM Modulation Index is the ratio of the peak frequency deviation to the maximum modulating frequency. The higher the index, the greater the received quality.
 $M \text{ Modulation Index} = (\text{peak frequency deviation} / \text{maximum modulation frequency})$

- FM Threshold :** FM Threshold is the point at which the input signal power is just strong enough to enable the receiver demodulator circuitry to successfully detect and recover a good quality television picture from the incoming video carrier.
- GHZ :** GigaHertz (GHz) is one billion (1×10^9) hertz, which is a measurement of frequency.
- GPS :** The Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides reliable location and time information in all weather and at all times when and where an unobstructed line of sight is available to four or more GPS satellites. The system is maintained by the United States government and is freely accessible by anyone with a GPS receiver. The Global Positioning System is making it possible for people using ground receivers to determine their geographic location within 10 meters to 100 meters. The satellites use simple mathematical calculations to broadcast information that is translated as longitude, latitude, and altitude by Earth-based receivers.
- IF :** Intermediate Frequency (IF) is a frequency to which a carrier frequency is shifted as an intermediate step in transmission or reception. An intermediate electromagnetic frequency is generated by a superheterodyne radio receiver.
- Impedance :** Impedance is a measure of RF component electrical resistance, measured in ohms. In most cable and antenna systems, the standard impedance is 50 ohms.

- Insertion Loss :** Insertion Loss (or Cable Loss) is a measure of the total amount of signal energy absorbed (lost) by the cable assembly. It is measured in dB. S21 (an S-Parameter) is another name for this measurement.
- IP Address :** An Internet Protocol address (IP address) is usually a numerical label that is assigned to each device (computer or printer for example) that is participating in a computer network that uses the Internet Protocol for communication. An IP address serves two main functions: location addressing and host (or network) interface identification. The Internet Protocol originally defined an IP address as a 32-bit number. This was known as Internet Protocol Version 4 (IPv4), which is still in use. Growth of the Internet requires a new addressing system. An Internet Protocol Version 6 (IPv6) that uses 128 bits for the address was developed in 1995, and it is standardized as RFC 2460. IPv6 began being deployed worldwide in the year 2000. IP addresses are binary numbers, but they are usually stored in text files and displayed in human-readable notations, such as decimal nnn.nnn.nnn.nnn or 172.16.255.1 (for IPv4), and hexadecimal nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn or 2C01:AB18:0:1234:FF03:567C:8:1 (for IPv6). In IPv4, each decimal group (nnn) represents values from 000 to 255, or binary values of 8 bits. In IPv6, each hexadecimal group (nnnn) represents values from 0000 to FFFF, or binary values of 16 bits (0000 0000 0000 0000 to 1111 1111 1111 1111).

- IPv6** : Internet Protocol Version 6 (IPv6) is a numerical label that is used to identify a network interface of a computer or other network node participating in an IPv6-enabled computer network. IPv6 uses 128 bits for the address (as compared to an IPv4 address, which is defined as a 32-bit number). Pv6 was developed in 1995, and it is standardized as RFC 2460. V6 began being deployed worldwide in the year 2000. I addresses are binary numbers, but they are usually stored in text files and displayed in human-readable notations, such as hexadecimal
nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn or 2C01:AB18:0:1234:FF03:567C:8:1 (where FFFF [Hex] = 65535 [Dec]). Ea hexadecimal group (nnnn) represents values from 0000 to†FFFF, or binary values of 16 bits (0000 0000 0000 0000 to 1111 1111 1111 1111).
- LPA** : Linear Power Amplifier (LPA) is the final amplification stage in a multicarrier transmitter that has been designed and optimized to produce a linear response. By operating in the linear mode, the amplifier reduces the non-linear effects that produce intermodulation products and side-lobe spectra that cause adjacent channel interference.
- LRL** : Line Reflect Line (LRL, also called TRL) method of calibration developed by Anritsu. LRL uses two (or more) transmission lines and a reflect standard (for each port). The line lengths are important because the two lines look electrically distinct at all times (meaning it will not work at DC, nor at a frequency where the difference in length is an integral number of half wavelengths). The reflect standard is not too important because it is only assumed to be symmetric (the same at

both ports) and not too high a return loss (practically speaking, even 20 dB return loss will usually work). The lines are assumed to be perfect, with no mismatch, which usually means airlines for coaxial calibrations, although other structures can be used. On-wafer transmission lines can usually be very good, and this cal approach will work well if one can handle the required probe movement.

LRM : Line Reflect Match (LRM) method of calibration developed by Anritsu. In LRM, one of the lines of the LRL method is replaced with a match (or load). For basic LRM, the match is assumed to be perfect, and thus represents a line of infinite length. For cases where the load is well understood, improvement in accuracy can be achieved by using ALRM and incorporating the load model. So in some sense, this cal relates back to the concept of the defined standards. Because only one line is involved, this calibration can work down to DC and up to very high frequencies (practically limited by the match knowledge/characterization). Some variations allow one to trade one of the match measurements for a pair of additional reflect measurements (a second reflect standard is needed). Because of the requirement (in this case) that the reflect standards be distinct, the calibration may become band limited.

LST : Line Sweep tools (LST) is PC-based post-processing software that efficiently manipulates line sweep and PIM traces for reporting purposes.

MHz : Megahertz (MHz) - One MHz is equal to one†million†Hertz, and is a measurement of frequency.

- NF** : Noise Figure (NF) is a measure of degradation of the signal-to-noise ratio (SNR) that is caused by components in a radio frequency (RF) device. The noise factor (F) of a system is defined as the signal-to-noise ratio of the input power of the system divided by the signal-to-noise ratio of the output power of that system. F (the noise figure) is defined as the decibel value of the noise factor. $NF = 10\log(F)$ where log uses the base 10, or common log. This formula is valid only when the input termination is at standard noise temperature.
- OBW** : Occupied Bandwidth (OBW) is a measure of the bandwidth containing 99% of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency. Interference to other channels or to other systems can occur if OBW is too large.
- OSL** : OSL or Open Short Load calibration method for coaxial line types. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with SSL or Offset Short 1, Offset Short 2, Load calibration method for waveguide line types.
- OSLT** : OSLT or Open Short Load Thru calibration method for coaxial line types. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with SSLT or Offset Short 1, Offset Short 2, Load, Thru calibration method for waveguide line types.

OTA : Over The Air (OTA): OTA refers generally to any transfer of information or signal that takes place in a wireless environment, rather than using a wired connection. OTA is usually used in connection with a standard defining the provisioning of mobile devices and applications, such as downloading or uploading content or software, and commonly used in conjunction with the Short Messaging Service (SMS). SMS OTA Messages contain information that is used to configure the settings of a WAP browser in a mobile phone (refer to SMS and WAP).

RBW : Resolution Bandwidth (RBW) With spectrum analyzers, a narrow band filter is swept across a frequency span to create the spectrum display. The filter bandwidth (RBW) determines the frequency resolution across the frequency axis.

Remote Access

Point : Remote Access Point, also known as relay access points, is one of a number of secondary access points in a wireless network that uses Wireless Distribution System (WDS) to extend its range. Remote access points connect to a master access point.

Return Loss : Return Loss is a measurement (in dB) of reflected energy caused by impedance mismatch. May also be referred to as S11. Although S11 values are expressed as negative numbers, Return Loss values are expressed as positive numbers because by definition the "Loss" expression implies a negative sign. The higher the value, the better the impedance match (think of a large negative number being less than a smaller negative number). 40 dB is nearly ideal. Only 0.01 % of the total transmitted power is reflected if the Return Loss measurement value is 40 dB. A measured value of 0 dB would be a complete reflection, or stated another way, 100 % of the transmitted power is reflected back. Return Loss is typically a pass/fail measurement.

RF : Radio Frequency (RF) is the frequency of radio sine waves. RF generally refers to wireless communications within a frequency range of 3 kHz to 300 GHz. Formally, according to the Article 2 of the Radio Law, radio frequency is below 3,000 GHz. Radio frequencies can be used for communications between a mobile telephone and an antenna mast.

RSSI : Received Signal Strength Indicator (RSSI) is a measurement of the power present in a radio signal when received and measured. RSSI is useful for observing signal strength at a single frequency over time.

SCPI : Standard Commands for Programmable Instruments (SCPI)

Signal loss : Signal loss is the amount of signal strength that is lost in antenna cable, connectors, and free space. Signal loss is measured in decibels.

Smith Chart : A Smith Chart is a graphical aid for electrical and electronics characteristics in radio frequency (RF) circuits. Smith Chart was invented by Phillip Smith at Bell Laboratories in 1939. The chart can be used to display multiple parameters, such as impedance, and admittance.

SOLR/SSLR/SSSR : Short-Open-Line-Reciprocal (SOLR), Short-Short-Line-Reciprocal (SSLR), and Short-Short-Short-Reciprocal (SSSR) are calibrations similar to SOLT/SSLT/SSST, but used when a good Thru is not available. They have some accuracy degradation due to a less defined Thru and have disadvantages of the parent calibration.

SOLT : SOLT or Short Open Load Thru calibration method for coaxial line types with simple and redundant standards. It is not band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with SSLT or Offset Short 1, Offset Short 2, Load, Thru calibration method for waveguide line types.

SSL : SSL or Short Short Load or Offset Short 1, Offset Short 2, Load calibration method for waveguide line types uses Shorts with different offset lengths. It is a calibration (common in waveguide) with simple and redundant standards, but it is band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies. Offset Short 1 is $1/8$ wavelength, and Offset Short 2 is $3/8$ wavelength. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with OSL or Open Short Load calibration method for coaxial line types.

SSLT : SSLT or Short Short Line Thru or Offset Short 1, Offset Short 2, Load, Thru calibration method for waveguide line types uses Shorts with different offset lengths. It is a calibration (common in waveguide) with simple and redundant standards, but it is band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies. Offset Short 1 is $1/8$ wavelength, and Offset Short 2 is $3/8$ wavelength. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with OSLT or Open Short Load Thru calibration method for coaxial line types.

TMA : A Tower Mounted Amplifier (TMA) amplifies signals from an antenna to reduce the signal to noise ratio of a base transceiver station (BTS). This helps to improve the overall sensitivity of the BTS. A TMA is a low-noise amplifier (LNA) that is usually mounted as close as practical to the antenna in Base Transceiver Stations or in mobile masts. When using a TMA, the antenna is able to receive weaker signals.

VBW : Video Bandwidth (VBW)

VSWR : Voltage Standing Wave Ratio (VSWR). VSWR is another method to measure reflected energy caused by impedance mismatch. It is expressed as a ratio of X:1. VSWR measures the voltage peaks and valleys. A ratio of 1:1 would be a perfect match. A typical cable and antenna system would be around 1.43:1 (VSWR) or 15 dB Return Loss.

Watt : Watt (W) is a unit of measure for power.

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