User Guide

Site Master™
S331L User Guide

Handheld Cable and Antenna Analyzer Featuring Classic and Advanced Modes

**2 MHz to 4 GHz Cable & Antenna Analyzer
50 MHz to 4 GHz Power Meter**

/Anritsu

Table of Contents

Chapter 1—General Information

Chapter 2—Instrument Overview

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Chapter 6—High Accuracy Power Meter

Table of Contents (Continued)

Chapter 7—Calibration

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Index

Chapter 1 — General Information

1-1 Introduction

The Site Master S331L User Guide is part of a set of manuals that provide information about the instrument.

Additional Documents

The following documents provide additional information about the Site Master S331L Cable and Antenna Analyzer.

- Handheld Instruments Product Information, Compliance, and Safety Guide (10100-00065). Provides important safety, legal, and regulatory notices. Read this guide *before* operating the equipment.

- Site Master S331L Technical Data Sheet (11410-00616). Includes general specifications, detailed measurement specifications for all available measurement modes, ordering information, and available accessories.

- Site Master S331L Product Brochure (11410-00640). Includes an overview of the of the Site Master S331L instrument, ordering information, and accessories information.

- Site Master S331L Maintenance Manual (10580-00323). Includes general information on the instrument, test equipment required, a replaceable parts list, and verification procedures including frequency accuracy, return loss, and dynamic range.

These documents along with additional applications notes and white papers covering cable and antenna analysis are available on the documentation disc included with the instrument and also from the Anritsu web site on the Site Master S331L product page:

http://www.anritsu.com/en-us/products-solutions/products/s331l.aspx

This chapter provides a general overview and information about frequency range, additional documents, preventive maintenance, and annual verification requirements for the Anritsu Handheld Site Master S331L.

Chapter 2, "Instrument Overview" provides basic operation information for the Site Master.

Chapter 3, "Cable and Antenna Measurements" gives an overview of line sweeping and provides setup information and examples of typical measurements.

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, "Internal Power Meter" details use of the internal power meter.

Chapter 6, "High Accuracy Power Meter" details use of the high accuracy external USB power meter including sensor connection and setup.

Chapter 7, "Calibration" explains why calibration before making a measurement is critical in line sweeping and details the calibration methods available including a comparison of Standard Cal to FlexCal and using the built-in InstaCal module or external Open, Load, and Short (OSL) components.

Chapter 8, "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 in internal memory or an external USB memory device.

Chapter 9, "System Operations" reviews various instrument management features of the Site Master including: System menu, Preset menu, ScrnShot capture, Touch menu, and Help menu.

Chapter 10, "Battery Replacement" explains how to replace the Site Master batteries.

Chapter 11, "Anritsu Tool Box with LST" is a program designed to increase productivity and create reports for people who work with cable and antenna traces.

Chapter 12, "Anritsu easyTest Tools" is a program designed to create test sequences to simplify operation of the S331L.

Chapter 13, "Video Inspection Probe (VIP)" is a program used to test the condition of a fiber optic termination. A Video Inspection Probe like the Anritsu Model G0306A must be connected to the instrument.

Appendix A, "Instrument Messages" provides details regarding messages displayed on the S331L Site Master.

Document Conventions

Main menus and keypad buttons are shown in the user guide using a
Serif Bold typeface. Main menus are the six button displayed at the
bottom of the touchscreen. Submenus and submenu buttons are
displayed on the right side of the touchscreen display and shown in the
user guide using Serif Regular typeface.

Menu and button locations may be described in this document by their
path:

  Measurement > VSWR

The line above reads as "Press the Measurement main menu, then press
the VSWR button."

Contacting Anritsu for Sales and Service

To contact Anritsu, please visit: http://www.anritsu.com/contact-us

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

Updated product information can be found on the Anritsu Web site:
http://www.anritsu.com/

Search for the product model number. The latest documentation is on
the product page under the Download Library tab:

http://www.anritsu.com/en-us/products-solutions/products/s331l.aspx

1-2   Instrument Description

The Site Master S331L is a one-port, 2 MHz to 4 GHz hand held cable
and antenna analyzer designed to make Return Loss, VSWR, Cable
Loss, Distance-To-Fault (DTF), and power measurements in the field.
The analyzer is an integrated multi-functional test instrument that
eliminates the need to carry multiple test sets. In addition to the cable
& antenna measurements, the instrument includes an integrated
InstaCal module, internal power meter, and high accuracy external
USB power meter mode utilizing Anritsu's external USB sensors
(sold separately).

The bright, high-resolution, 800 pixel by 480 pixel 7 inch color display provides easy viewing in a variety of lighting conditions. The combination of a resistive touchscreen and keypad enables users to navigate menus with the touchscreen and enter text or numbers directly. A user-editable EZ Name Matrix allows users to configure complex sweep names quickly, saving hours of valuable time daily. The Site Master is equipped with factory installed Li-Ion batteries delivering more than eight hours of battery life when fully charged.

The internal memory is large enough to store more than 1,000 files. Files can be any combination of measurement files, setup files, or screen shots. Files can also be saved or copied to a connected USB flash drive. Measurements can be transferred to a PC using the supplied USB cable or with a USB flash drive.

Included with the S331L is Line Sweep Tools (LST), a PC based software program than can be used to create reports, view and organize data, analyze historical data, edit markers and limit lines, rename traces and trace analysis. Refer to Chapter 11 for a brief overview of Line Sweep Tools.

Anritsu easyTest Tools provides a library of commands and a drag & drop interface for creating test sequences. The Windows XP/Vista/7 compatible software is available on the Anritsu Web site.

- A developer creates an easyTest test sequence (.ett) file on a PC. The file is copied to the S331L using a USB flash drive.

- When the file is run using the easyTest icon on the Menu Shortcut screen, the S331L will display instructions one step at a time to the operator, simplifying the process of operating the instrument and completing the assigned tasks.

easyTest Tools Quick Start Guide, full use instructions, and sample .ett files are included with the software. After installing easyTest tool on a PC, start the application and choose Help for additional information.

Refer to Chapter 12 for a brief overview of easyTest Tools.

SweepMasters DIRECT is an easy to use on-line trace delivery service for your S331L cable and antenna analyzer test results. It allows you to capture, upload, and deliver traces. A subscription to SweepMasters DIRECT is included with the Site Master S331L. Details are available at: http://direct.sweepmasters.com/register.

A complete suite of computer software applications are available for download:

http://www.anritsu.com/en-US/Services-Support/Handheld-Tools-Tool-Box.aspx

Available Options

The Site Master Technical Data Sheet contains a list and description of available options including standard or premium calibrations and extended warranties. The data sheet is provided with the instrument and available on the Anritsu web site: http://www.anritsu.com.

Standard Accessories

The Anritsu Site Master S331L includes a one year warranty which includes: battery, firmware, software, and Certificate of Calibration.

The Site Master Technical Data Sheet also contains a list and description of standard accessories.

Optional Accessories

The Site Master Technical Data Sheet (p/n 11410-00616) also contains a list and description of available optional accessories. The data sheet is provided with the instrument and available on the Anritsu Web site: http://www.anritsu.com.

URL for Site Master S331L:

http://www.anritsu.com/en-us/products-solutions/products/s331l.aspx

Site Master Specifications

Refer to the Site Master Technical Data Sheet.

Battery Information

The batteries that are supplied with the Site Master may need charging before use. They can be charged using either the AC-DC Adapter or the DC adapter. Refer to "Status Tool Bar" on page 2-17 for a description of battery symbols. The batteries are charged in the instrument and only removed for replacement.

Note	Use only Anritsu Company approved batteries, adapters, and chargers with this instrument.
	The batteries will charge at a faster rate when the instrument is turned off or is set to standby mode. Charging the batteries while the instrument is running will take a longer time to reach a full charge.
	To prolong the useful battery life, the internal charging circuit monitors each battery's temperature. Normal charging occurs when the battery temperature is between 0 °C and 45 °C. Charging is paused if the internal battery temperature is beyond this range.

Caution	When using the Automotive Cigarette Lighter Adapter, always verify that the supply is rated for a minimum of 40 Watts @ 12 VDC, and that the socket is clear of any dirt or debris. If the adapter plug becomes hot to the touch during operation, then discontinue use immediately.

The Site Master batteries are installed at the factory and can be replaced by the user. Refer to Chapter 10, "Battery Replacement" for information on replacing the batteries. The batteries are charged with the included AC/DC adapter.

Note	Anritsu Company recommends removing the battery for long-term storage of the instrument.

1-3   Instrument Care and Preventive Maintenance

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

Caution	To avoid damaging the display or case, do not use solvents or abrasive cleaners.

Clean the RF connectors with a cotton swab dampened with denatured alcohol. Visually inspect the connectors. If you are unsure whether the connectors are undamaged, gauge the connectors to confirm that the dimensions are correct.

Carefully inspect the test port cable. The cable should be uniform in appearance, and not stretched, kinked, dented, or broken. A defective test port cable is the most common cause of unreliable or erratic measurements. Extra care should be exercised to ensure the test port cable remain in good condition.

ESD Caution

The Site Master, like other high performance instruments, is susceptible to electrostatic discharge (ESD) damage. Coaxial cables and antennas may build up a significant static charge, which may damage the Site Master. To prevent ESD damage, users are advised to connect a short to either end of the cable before connecting the cable to the Site Master. If no short is available then a termination (load) may be used. Site Master operators must always be aware of the potential for ESD damage and take all necessary precautions. Operators should exercise practices outlined within industry standards such as JEDEC-625 (EIA-625), MIL-HDBK-263, and MIL-STD-1686; which pertain to ESD and ESDS devices, equipment, and practices. It is important to remember that the operator may also carry a static charge that can cause damage. Following the practices outlined in the above standards will ensure a safe environment for both personnel and equipment.

1-4   Calibration and Annual Verification

The Cable and Antenna Analyzer requires user performed calibration before making line sweep measurements. Calibration can be quickly and easily performed at the end of a test port cable (not included) using the built-in InstaCal module. External OPEN, SHORT, and LOAD (OSL) calibration method is another option and requires Anritsu OSL components which are sold separately. FlexCal is supported using either calibration method. Refer to Chapter 7, "Calibration" for additional information.

The external InstaCal Calibration Modules (ICN50 and ICN50B) are *NOT* compatible with the Site Master S331L.

Note	Anritsu recommends allowing the S331L to warm up for 5 minutes to typical operation temperature before calibrating. The instrument will require a new calibration if the internal instrument temperature changes more than ±20 ºC after calibration.

Anritsu recommends an annual calibration and performance verification of the Site Master by local Anritsu service centers. Anritsu service also recommends a semi-annual verification of OSL calibration components.

The Site Master is self-calibrating and there are no field-adjustable components. The OSL calibration components and the Internal InstaCal are crucial to the integrity of the user calibration. As a result, they must be verified periodically to ensure performance conformity. This is especially important if the OSL calibration components have been accidentally dropped or over-torqued.

Contact information for Anritsu Service Centers is available at:

http://www.anritsu.com/contact-us

1-5   Secure Environment Workplace

This section describes the types of memory in the Site Master, how to delete stored user files in internal memory, and recommended usage in a secure environment workplace.

Site Master Memory Types

The instrument contains non-volatile disk-on-a-chip memory, EEPROM, and volatile DRAM memory. The instrument does not have a hard disk drive or any other type of volatile storage memory.

EEPROM: This memory stores the model number, serial number, and calibration data for the instrument. Also stored here are the user-set operating parameters such as frequency range. During the master reset process, all operating parameters that are stored in the EEPROM are set to standard factory default values.

RAM Memory: This is volatile memory used to store parameters needed for the normal operation of the instrument along with current measurements. This memory is reset whenever the instrument is power cycled. Standby mode does not reset this memory.

External USB Flash Drive (not included with the instrument): This memory can be selected as the destination for saved files. The user can also copy the contents of the internal memory to the external flash memory for storage or data transfer. The external USB flash drive can be reformatted or sanitized using software on a PC.

Refer to Chapter 8, "File Management" for additional information on saving and copying files to the USB flash drive.

Note	The screen images on your instrument or computer may vary from what is shown in this User Guide.

Erase All User Files in Internal Memory

Perform a Master Reset:

1. Press the **Preset** (9) button.

2. Press the Reset drop down submenu then press the Reset button. Select Master Reset and read the description on the screen (Figure 1-1).
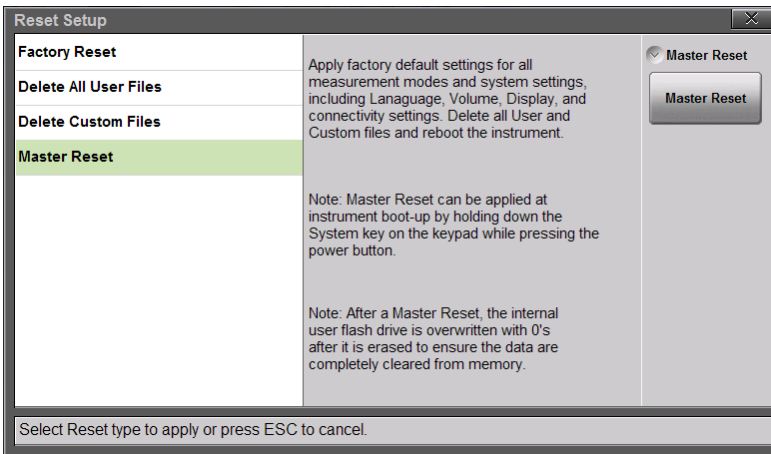
Figure 1-1.   Master Reset

3. To erase all user files in internal memory, press the Master Reset button. A dialog box is displayed on the screen warning that all settings will be returned to factory default values and all user files will be deleted (Figure 1-2).
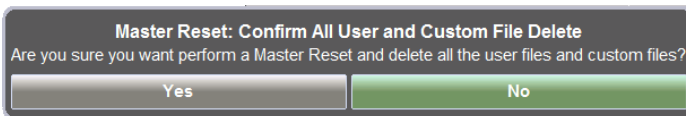
Figure 1-2.   Master Reset Confirmation

4. Press Yes to complete the master reset.

5. The instrument is now reset.

Refer to the for additional information on reset options.

Usage in a Secure Environment

Note	Not all USB flash drives are compatible with the S331L. Anritsu recommends performing a full FAT 32 long format prior to use with the instrument. Some USB devices may not be recognized even after formatting, in these cases the device must be replaced with another type.

Set the Site Master to save files to an external USB flash drive:

1. Attach the external flash drive and turn on the instrument.

2. Press the **File** (1) button, then Save.
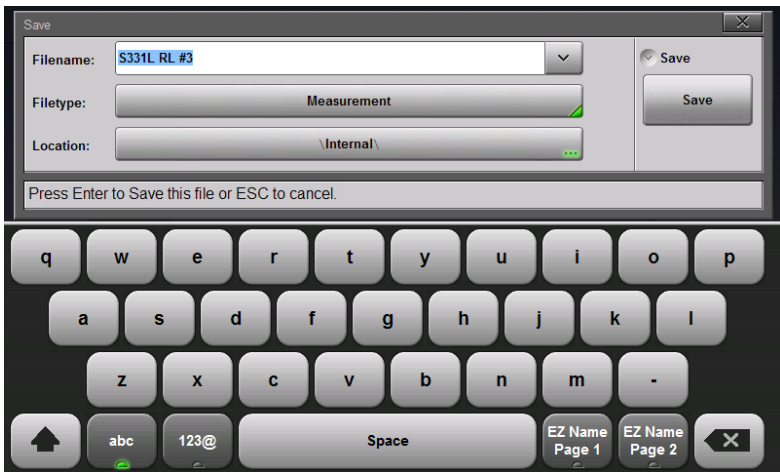
Figure 1-3.   Choose a Storage Drive

3. Press the Location button then double-tap on the word <u>DRIVE</u> or press the left arrow key until the external USB drive is displayed.
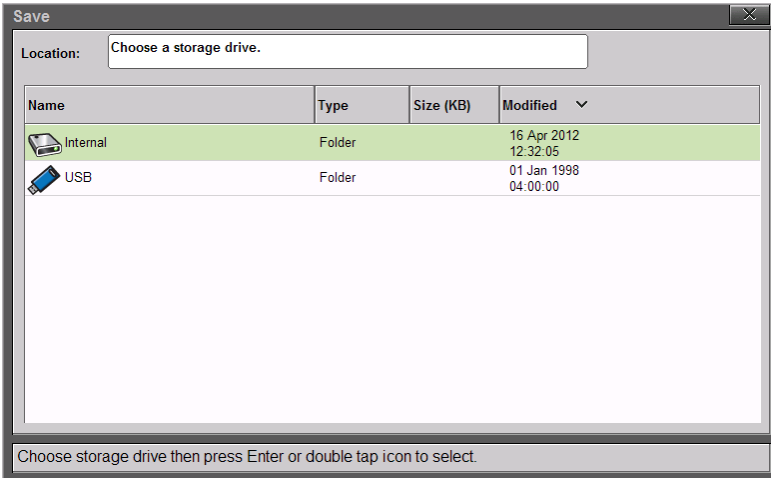
Figure 1-4.   Choose a Storage Drive

4. Double-tap on USB. The Location breadcrumb will change to <u>DRIVE</u> : USB.

5. Press the Set Location submenu key.

The external USB flash drive is now the default location for saving files.

Note	Refer to Chapter 8, "File Management" for detailed information.

Chapter 2 — Instrument Overview

2-1   Introduction

This chapter provides an overview of the Anritsu Site Master S331L. The intent of this chapter is to acquaint the user with the instrument and general functionality. For detailed line sweeping information, refer to Chapter 3 for Advanced mode or Chapter 4 for Classic mode. User calibration for Cable & Antenna Sweeping is reviewed in Chapter 7. Power Meter operation is reviewed in Chapter 5 and High Accuracy External USB Power Meter operation is reviewed in Chapter 6.

2-2   Turning On the Site Master

The Anritsu Site Master S331L is capable of approximately eight hours of continuous operation from a fully charged battery.

The Site Master can also be operated from a 12 VDC source (which will also simultaneously charge the battery). This can be achieved with either the Anritsu AC-DC Adapter or the Automotive Cigarette Lighter Adapter.

Caution	When using the Automotive Cigarette Lighter Adapter, always verify that the supply is rated for a minimum of 40 Watts @ 12 VDC, and that the socket is clear of any dirt or debris. If the adapter plug becomes hot to the touch during operation, discontinue use immediately.

To turn on the Site Master, press the green **On/Off** button on the front panel (Figure 2-1 on page 2-3). The Site Master takes approximately 90 seconds to complete initial power up and load the application software.

Momentarily pressing the **On/Off** button when the Site Master is operating will place the instrument into standby mode. A message "Going into Standby Mode" will be displayed and the touchscreen display will turn off. The green power LED will slowly pulse when the instrument is in standby mode. Press the **On/Off** button momentarily again to restore the instrument to standard operation.

5 minutes of inactivity will cause the Site Master to enter reduced power mode. The display screen brightness is reduced and the keypad backlighting is switched off. Touching any portion of the screen or any keypad press while in reduced power mode will instantly restore screen brightness and keypad backlighting.

Press and hold the **On/Off** button for a few seconds to completely shut down the Site Master. The current settings will be saved and a shutdown message will be displayed before the instrument turns off.

Note	If the instrument appears non-responsive or will not power down using the standard shutdown procedure, disconnect the external power supply, then press and hold the power button for 10 to 15 seconds to force an instrument shutdown. The current settings will not be saved.
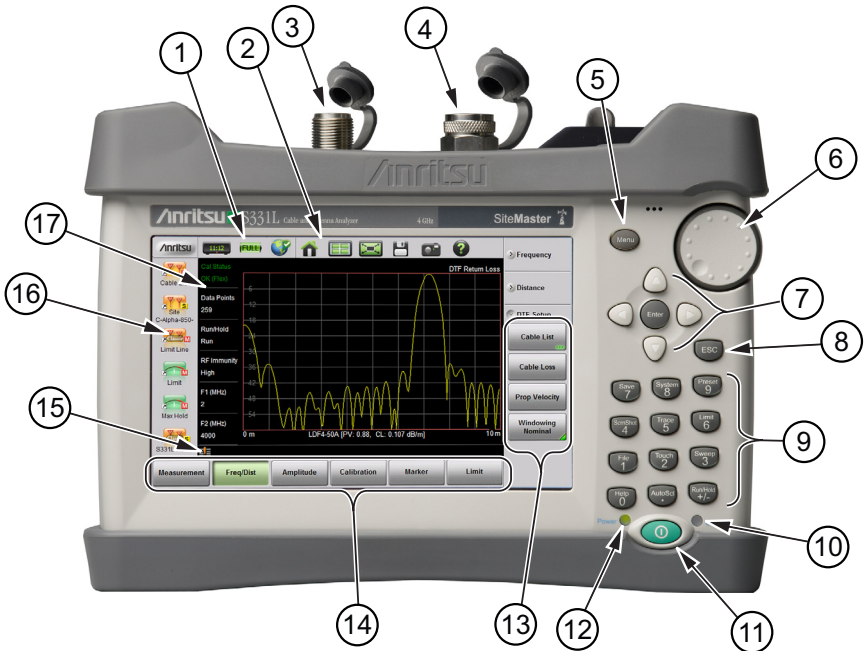
1	Status Tool Bar
2	System Function Tool Bar (not available in Classic mode)
3	RF Out/Reflect In Connector
4	Power Meter/Internal InstaCal Connector
5	Menu Key
6	Rotary Knob
7	Enter Key and Arrow Keys
8	ESC Key
9	Numeric Keypad and Menu Keys
10	Charge LED
11	On/Off Button
12	Power LED
13	Submenu Keys

Figure 2-1.   Site Master Instrument Overview (1 of 2)

14	Main Menu Keys
15	Warning and Status Area
16	Short Cut Tool Bar (not available in Classic mode)
17	Measurement Settings Summary (touchscreen menu shortcuts)

Figure 2-1.   Site Master Instrument Overview (2 of 2)

2-3   Test Panel Connector Overview

The test panel for the Site Master S331L is shown in Figure 2-2.

1	RF Out/Reflect In port (Type N, Female)
	50 ohm impedance. Maximum input is +23 dBm at ±50 VDC. Torque to 12 in·lbs.
	This connector port for Cable and Antenna measurements. Before making measurements, connect a phase-stable test port cable to the RF Out/Reflect In port connector and perform a calibration using the internal InstaCal (#2) or an external OSL. Refer to "Calibration Symbols" on page 2-26 and Chapter 7.
2	InstaCal/Power Meter port (Type N, Male)
	50 ohm impedance. Maximum input is +27 dBm, ±45 VDC. Torque to 12 in·lbs.
	This port supports dual functions. It can be used for performing user calibrations in both Cable & Antenna Analyzer modes, or it can be used as a power meter in Power Meter mode. It is not capable of performing both functions simultaneously.

Figure 2-2.   S331L Test Panel Connector (1 of 2)

3	USB Interface – Type A (version 2.0)
	The Site Master has two Type A USB 2.0 connectors that accept USB Flash Memory devices for storing or transferring measurements, setups, and screen shots. Certain USB peripheral devices such as a USB GPS module, USB mouse, or USB keyboard may also be supported.
4	External Power
	The external power connector is used to power the unit and for battery charging. Input is 11 VDC to 14 VDC at up to 3.0 A. When using the AC-DC Adapter, always use a grounded three-wire power cable that is connected to a three-wire power line outlet. Failure to use properly grounded electrical equipment may result in severe or potentially fatal injury.
5	USB Interface – Type Mini-B (version 2.0)
	The USB 2.0 Mini-B connector can be used to connect the Site Master directly to a PC. The first time the Site Master is connected to a PC, the normal USB device detection by the computer operating system will take place.
	When connecting the Site Master to a local area network, use an Anritsu-approved USB-to-RJ45 adapter. The instrument will obtain an IP address via DHCP, or a static IP address can be set by the user. Refer to "Status Menu" on page 9-16 for information about obtaining the IP address of the instrument.
6	Removable Torque Multiplier Nut
	Used to assist in firmly securing RF cable(s) to the InstaCal/Power Meter (4) port.

Figure 2-2.   S331L Test Panel Connector (2 of 2)

2-4   Front Panel Overview

The Site Master menu-driven interface is easy to use and requires little training. The Site Master uses a touchscreen, keypad, arrow keys, and rotary knob for data input. The menu and submenu keys will vary depending upon the selected mode of operation.

The numeric keypad keys are dual purpose, depending upon the current instrument state. The dual-purpose keys are labeled with a number on the key and the alternate function printed above. The numeric keys function when there is an active parameter entry dialog box open. The **ESC** key is used for aborting data entry and closing menus. The rotary knob, the four arrow keys, and the keypad can also be used to change the value of most active parameters.

Note	The Site Master S331L is shipped with a Stylus Pen that can be used for touchscreen entry. The Site Master is also compatible with a standard corded USB mouse. Plugging the mouse into one of the USB ports on the Site Master will automatically display the mouse cursor arrow on the display. Mouse input can now be used in combination with touchscreen entry. If the mouse cursor is not displaying, confirm that the Cursor button under the **Touch** (2) menu is turned On.

Front Panel Keys

Menu Key

Press the **Menu** key to open the Menu screen. Select the desired operating mode by touching one of the large mode icons in the top row or by touching one of the user-created shortcuts below. User-created shortcuts may include measurement setups or submenu key shortcuts. Shortcuts can be added, deleted, or moved as described below.

Measurement mode icons are pre-installed and cannot be moved or deleted. The smaller shortcut icons are easily created or deleted by the user.

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

The shortcut icons on the left of the Menu screen are available for direct access. These shortcuts do not appear in Classic mode and are therefore not available for direct access. The shortcuts are only available in Classic mode by pressing the **Menu** key.

Create a Menu Shortcut for a Submenu Key

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

Create a Menu Shortcut for a Setup File

Press **File** (1) then the Recall submenu key to display saved files. Locate the setup file to shortcut and then using the touchscreen press and hold on the file name for a few seconds. The Menu screen will automatically be displayed. Select a location to save the setup file shortcut icon.

User-defined shortcuts will stay in memory until deleted. To delete or move a shortcut button, press the **Menu** key then press and hold the shortcut for approximately 3 seconds. The Customize Shortcut dialog box allows the shortcut to be deleted or moved (Figure 2-3). If Move is selected, a green rectangle will outline the shortcut button. Touch the new location where the button is to be placed. If the location is empty, the outlined button will move there. If the location contains a button already, the buttons will swap locations.
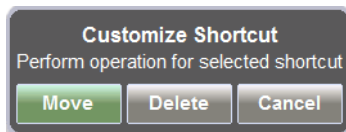
Figure 2-3.   Customize Shortcut

Figure 2-4 shows the **Menu** key screen with shortcut icons for the installed measurement modes. Touch one of the icons in the top row to change measurement modes.

Figure 2-4.   Menu Key Screen, Icons for Installed Measurements and
Shortcuts
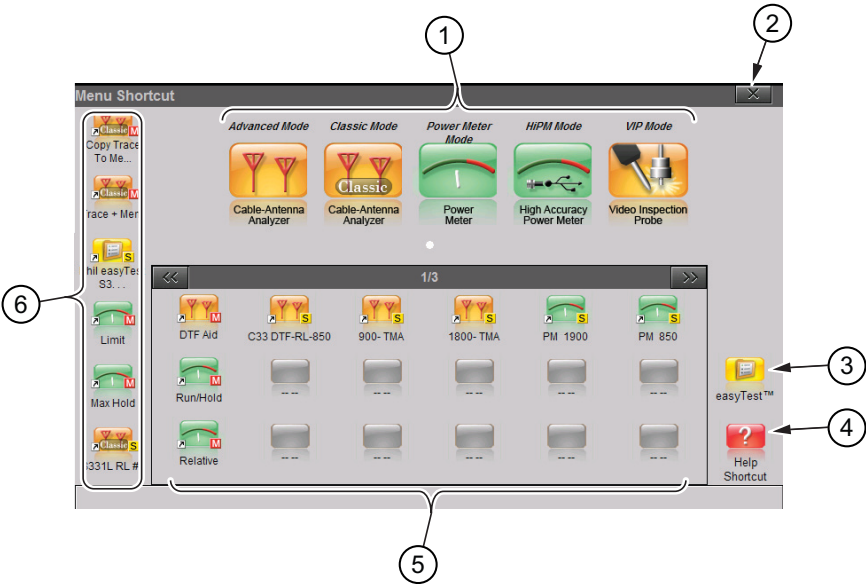
1	Installed Measurement Modes
2	Close Box
3	Icon to Launch easyTest. Refer to Chapter 12.
4	Help for Menu Screen
5	Installed Setup and Menu Shortcuts (Screen 1 of 3)
6	Shortcuts Displayed in All Menus (not available in Classic Mode)

Note	Shortcuts for both menu buttons and setup files can be deleted as a group under the **Preset** Menu > Reset submenu. Select Delete Custom Files, then select the Menu Shortcuts checkbox. Press the Delete Custom Files button.
	Refer to "Preset Menu" on page 9-24 for additional information.

ESC Key

Press this key to cancel any setting that is currently being made or to close the currently dialog box.

Enter Key

Press this key to finalize data input or select a highlighted item from a list.

Arrow Keys

The four arrow keys (around the **Enter** key) are used to scroll up, down, left, or right. The **Up/Down** arrow keys can often be used to change a value or to change a selection from a list. This function is similar to the function of the rotary knob. The **Left/Right** arrow keys can be used to move markers and the **Up/Down** arrow keys can also be used to move limit lines.

In Video Inspection Probe (VIP) mode, use the arrow keys to pan a captured image. Refer to Chapter 13.

Number Keypad

The Number keypad has two functions: The primary function is number entry. The secondary function of the number keypad is to list various menus. See "Keypad Menu Keys (1 to 9)".

Rotary Knob

Turning the rotary knob changes numerical values, scrolls through selectable items from a list, and moves markers or limit lines. In VIP mode, use the rotary knob to zoom in and out on a captured image.
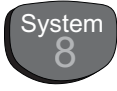
Keypad Menu Keys (1 to 9)

Not all Menus are active in various measurement modes. If any one of these menus is available in a specific instrument mode of operation, then it can be called from the number keypad. It may also be available from a main menu key or a submenu key (Table 2-1 on page 2-10).

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

Menu	Description
Help 0	Displays options to view information about the instrument status, an on screen list of Frequently Asked Questions (FAQ) and the User Guide in .html format. Refer to Chapter 9.
File 1	Allows the user to save, recall, copy, and delete files in internal memory or an external USB flash drive. Refer to Chapter 8.
Touch 2	Opens the touchscreen calibration function. Refer to Chapter 9.
Sweep 3	Displays the Sweep Setup menu to adjust Sweep Type. Sweep settings are displayed left of the graticule. Function varies by measurement mode. Refer to Chapter 3 for Cable & Antenna mode and Chapter 5 for Power Meter mode.
ScrnShot 4	Captures an image of the current display and saves a .png file to internal memory. Files are named based on the measurement type and automatically saved to internal memory in the ScrnShots folder. Refer to "Screen Shot Capture" on page 9-11 for additional information.
Trace 5	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. Not applicable in Power Meter mode. Refer to "Trace" on page 3-45 for detailed instructions.
Limit 6	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 and Chapter 5 for Power Meter mode. Refer to "Limit Menu" on page 4-8 for the Classic mode Limit menu.

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

Menu	Description
Save 7	Opens the Save menu to allow for quick saving of the current measurement, setup, or screen shot of the current display to internal memory or an external USB device. Refer to Chapter 8.
System 8	Opens the System menu and provides access to System Information, System Setups, and Diagnostic tools. Refer to Chapter 9 for additional information.
Preset 9	Opens the Preset/Reset submenus for resetting the Site Master back to default settings, deleting custom files, and updating instrument firmware. Refer to Chapter 9 for additional information.
AutoScl .	Auto scales the Amplitude axis. Refer to Chapter 3 for Cable & Antenna mode and Chapter 5 for Power Meter mode.
Run/Hold +/-	Toggle 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 Chapter 3 for Cable & Antenna mode and Chapter 5 for Power Meter mode.

LED Indicators

Power LED

The Power LED is solid green when the unit is on and slowly pulses when the Site Master is in standby mode.

Charge LED

The LED is green when the Site Master is on and the battery is fully charged. The LED is orange when the battery is charging and off when the Site Master has no external power.

Press the battery icon ![battery icon] at the top of the screen to view the current battery charge.

2-5   Touchscreen Display Overview

Note	Screen captured images are provided as examples. The image and measurement details shown on your instrument may differ from the examples in this measurement guide.

Figure 2-5 illustrates some of the Site Master user interface features.

Figure 2-5.   Site Master Display Overview (1 of 2)
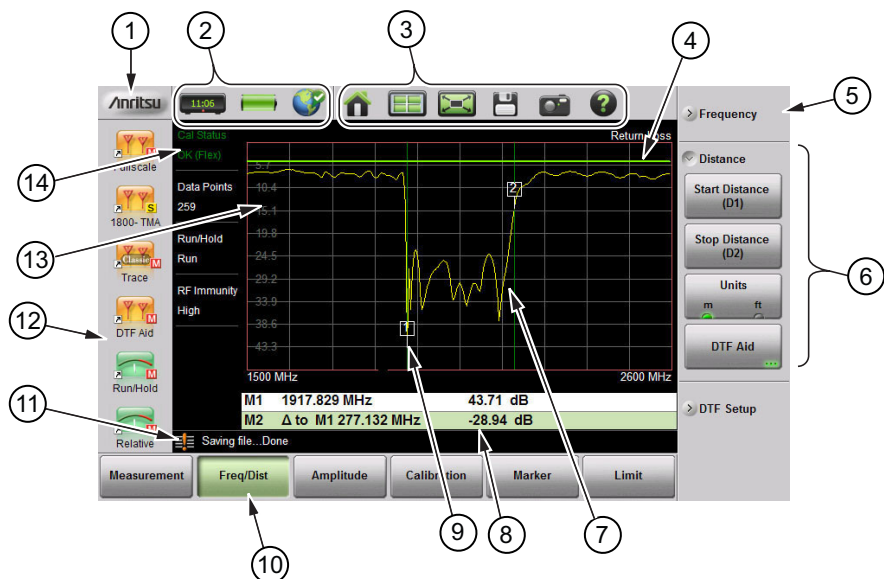
1	Anritsu Logo. Displays the System Status dialog screen. Press **ESC** or ▣ to close. Refer to the "Status Menu" on page 9-16 for additional information.
2	Status Tool Bar. Refer to "Status Tool Bar" on page 2-17 for information on each icon.
3	System Function Tool Bar. Shortcuts to various system functions. See "System Function Tool Bar" on page 2-20 for information on each icon. Not displayed in Classic Mode.
4	User-defined Limit Line.
5	Collapsed submenu. Pressing a collapsed submenu will cause it to expand as shown in row 2. Refer to "Submenu Keys" on page 2-13.

6	Expanded submenu. Expanded submenus display the function buttons.
7	Active trace sweeping between Start Frequency (F1) and Stop Frequency (F2).
8	Marker Table. Refer to "Markers" on page 3-38.
9	Marker 1.
10	Main Menu keys with Freq/Dist selected. Refer to "Main Menu Keys " on page 2-13.
11	Warning and Status Area.
12	User-defined Shortcuts. Refer to "Menu Key" on page 2-6. Not displayed in Classic Mode.
13	Graticule, a 10 x 10 grid showing the active trace.
14	Measurement Information. Displays current status. May also be used as a touchscreen shortcut to submenus.

Figure 2-5.   Site Master Display Overview (2 of 2)

Main Menu Keys

These six main menu keys are horizontally arranged along the lower edge of the touchscreen. The main menu key functions change based on the instrument mode. The instrument mode is set with the **Menu** key or the mode selector icon ⊞ (not available in Classic mode). The main menu keys generate function-specific submenus.

Submenu Keys

These submenu keys are arranged along the right-hand edge of the touchscreen. The submenu keys change based on the selected Main Menu or Keypad Menu key.

Several submenus may be displayed in the submenu block area. Press any collapsed submenu title to expand the submenu and display the submenu buttons. Press one of the submenu buttons 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 semicircle).
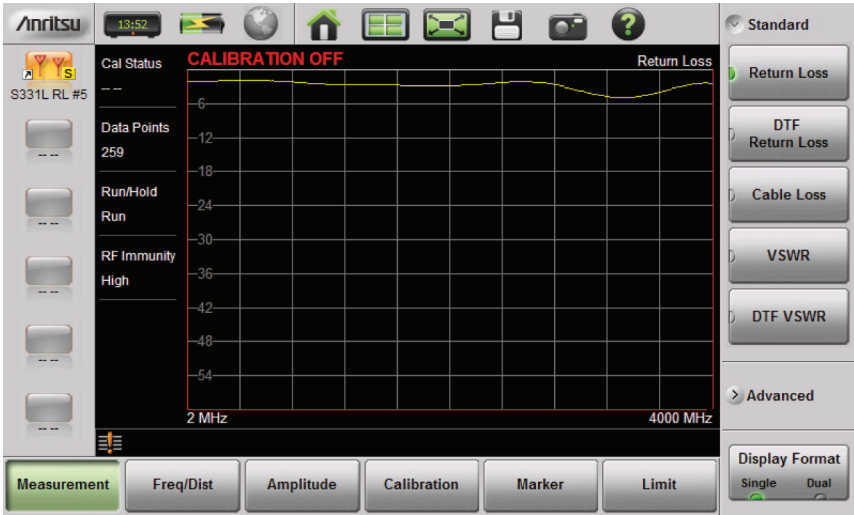
Figure 2-6.   Return Loss Measurement

Submenu Button Types

The Site Master interface uses several submenu button types. Each is described below in Table 2-2.

Table 2-2.   Submenu Button Examples (1 of 2)
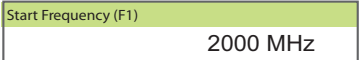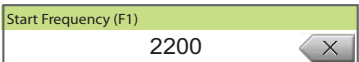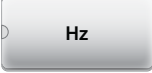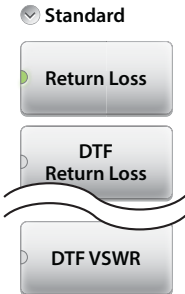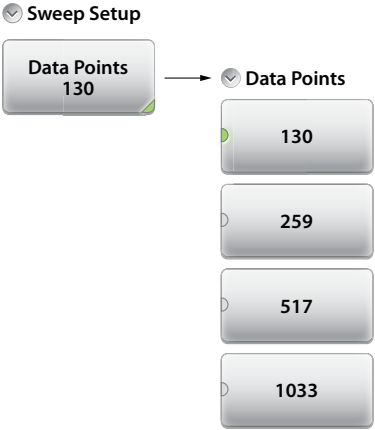
Button Description	Button Example
1. Numeric Entry *example:* Start Frequency (F1) button in the **Freq/Dist** menu. Opens a "Edit Parameter Window". Change the current value using the rotary knob, Up/Down arrow keys, or numeric keypad. Using the keypad will display terminator buttons. Press one of the buttons to complete the entry or press the **ESC** key to cancel the entry. Press ⬜✕ to delete the last number entered. Entering a value beyond the range of the instrument will set the parameter to the maximum or minimum value.	Start Frequency (F1) 2000 MHz Start Frequency (F1) 2200 ✕ ⬤ Frequency **Start Frequency (F1)** ⬤ Units **GHz** **MHz** **kHz** **Hz**
2. Toggle Each press of the button cycles between the available states. The active state is indicated by the glowing green semicircle at the bottom of the button.	⬤ Calibration **Cal Type** Standard Flex

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

Button Description	Button Example
3. Parameter Value *example:* **Measurement** main menu. This button is used when there are several options for the parameter. The current value is indicated by the glowing green semicircle at the left of the button.	Standard Return Loss DTF Return Loss DTF VSWR
4. Submenu Selection *example:* Data Points button in the **Sweep** (3) menu. The current value is displayed below the button name. Pressing the button displays a submenu of the available values. Press one of the buttons to select a new value. Press **ESC** to cancel. Submenu selection buttons are indicated by the glowing green triangle in the lower-right corner of the button.	Sweep Setup Data Points 130 → Data Points 130 259 517 1033
5. Dialog Pressing this button will display a dialog box or a list box. Press **ESC** to clear the dialog or list box. Dialog buttons are indicated by the 3 glowing green circles in the lower-right corner of the button.	System Info Status ...
6. Action Pressing an Action button triggers the submenu button function.	Marker Search Marker to Peak

Status Tool Bar

The Status Tool Bar includes icons to display the current time and date, battery charge, GPS status, and screen lock state. Tap one of the icons for additional information. Figure 2-7 shows the icons that are displayed in the Status Tool Bar area.

1	Clock icon. Press to set the current date, time, and time zone. Refer to "Date/Time" on page 9-14.
2	Battery icon. Press to view battery and charge status. Press **ESC** to close. The top row shows the battery icon when the battery is fully charged and the Site Master is plugged into the AC adaptor or car charger. The second row of battery icons show the charge level from 100% to 2% when the Site Master is running on battery power. The lightning bolt is displayed when the Site Master is charging from an AC adapter or the car charger and the battery is not fully charged yet. The third row shows the battery level from 2% to 100% under this condition.

Figure 2-7.   Status Tool Bar Icons (1 of 2)

2	Battery icon (continued). An exclamation point is displayed when the battery charging has paused, either due to the ambient temperature being too high or too low to safely charge the battery, or due to a fault in the battery. The exact cause is displayed in the battery dialog under charge status. The last row shows the battery level from 2% to 100% under this condition. The battery will resume charging automatically as soon as the pause conditions have changed.
	Refer to Chapter 10, "Battery Replacement" for additional information.
3	GPS icon. Press to view the current GPS information (Figure 2-8) obtained from an external USB-based GPS module. The icon indicates the status of the GPS module and location fix. After capturing a good fix, location data are saved with measurements (Figure 2-9) and screen captures.
	GPS status icon states:
	a. GPS module (H/W) is not connected. Connect an Anritsu approved GPS module.
	b. H/W connected without a current location fix. Module attempts to establish a location fix during this state.
	c. H/W connected with a current location fix.
	d. H/W not connected, instrument using last saved location fix. Pressing Reset button will place GPS in state "a."
	e. H/W connected, GPS fix lost, using last saved location fix. Pressing Reset button will place GPS in state "c."
4	Touchscreen Lock icon. The Lock icon is displayed when the touchscreen is locked (**Touch** (2) > Lock). When locked, the touchscreen will not register user input. A user may lock the screen in order to use the instrument exclusively with a USB mouse or with the Arrow Cursor control.
	The touchscreen should also be locked if it was registering unintended input that was not resolved with a touchscreen calibration. This scenario may happen after touchscreen damage. The Site Master can continue to be used to make measurements and save files even with touchscreen damage using a USB mouse or turning on the Arrow Cursor control. Refer to "Touch Menu" on page 9-3 for additional information.

Figure 2-7.   Status Tool Bar Icons (2 of 2)

Caution	Use only Anritsu-approved batteries, adapters, and chargers with this instrument.
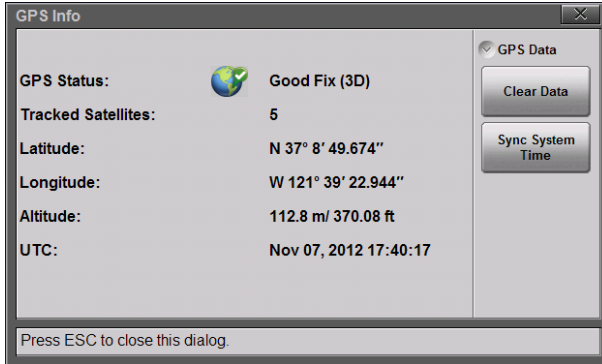
Figure 2-8.   GPS Info
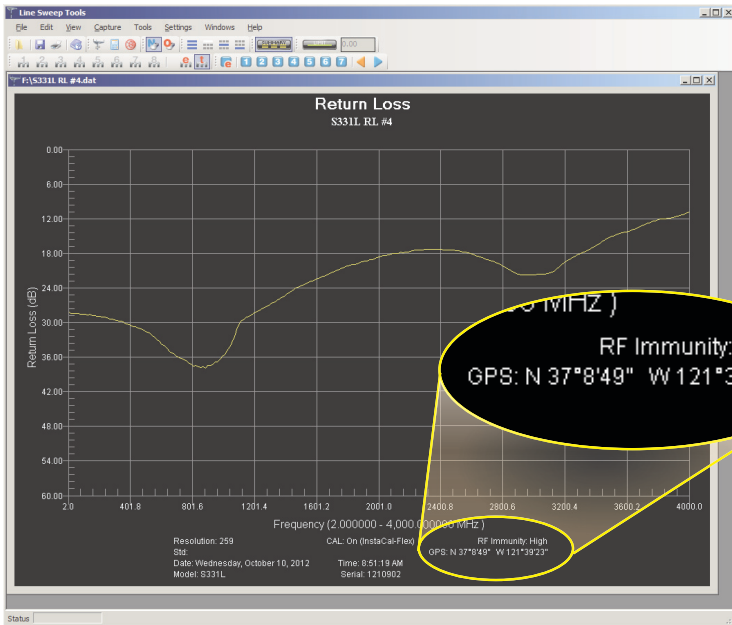
Figure 2-9.   Location Data Saved in Measurement File

System Function Tool Bar

The System Function Tool Bar icons allow quick access to functions that are not measurement specific. Figure 2-10 shows the icons that are displayed in the Status Tool Bar Area (not available in Classic mode).

1	Preset icon. Opens the **Preset** (9) Menu. See "Preset Menu" on page 9-24 for additional information.
2	Mode Selector icon. Press to change measurement mode (including switching between *Advanced* and *Classic* Cable-Antenna Analyzer mode). Tap an icon (Figure 2-11 on page 2-21) to change modes or press **ESC** to cancel.
3	Full Screen icon. Sets the display to full screen view mode (hides all of the tool bars, short cut icons, and menus). Full screen view increases the view size of the graticule. Press **ESC** to return to the standard view. Measurement menus are not available in Full screen mode however the AutoScl (.), Run/Hold (+/-), Save (7), and ScrnShot (4) menus will function in Full Scale mode. Displayed markers can also be moved using the touchscreen. Refer to Figure 2-12 on page 2-21 for a comparison of the two views.
4	Save icon. Shortcut to open the **Save** (7) menu. See "Save Files" on page 8-2 for additional information.
5	Screen Capture icon. Press to capture and save an image of the current screen. The file is automatically saved to internal memory in the ScrnShots folder. The file is automatically named based on the measurement type and saved in Portable Network Graphics (.png) format. Same function as pressing the **ScrnShot** (4) key. Refer to "Screen Shot Capture" on page 9-11 for examples and details on the image capture options (capture size, background color, and header/footer).
6	Help icon. Shortcut to open the **Help** (0) menu. See "Help Menu" on page 9-5 for additional information.

Figure 2-10. System Function Tool Bar Icons
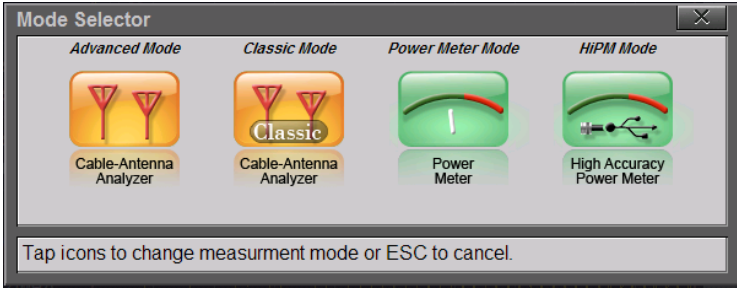
Figure 2-11. Mode Selector Table
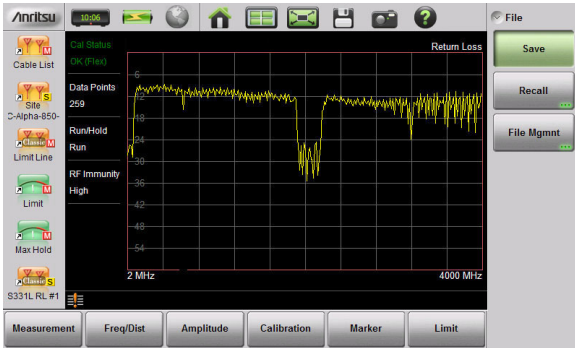
Standard View
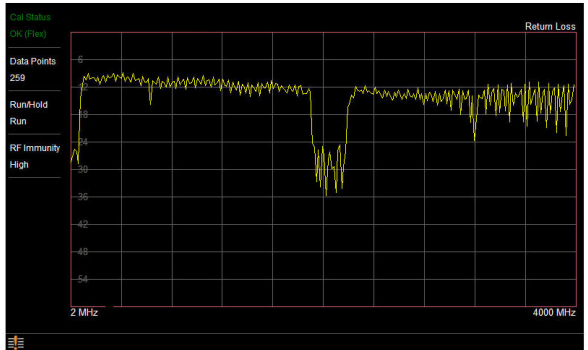
Full Screen View

Figure 2-12. Comparison of Standard Mode vs. Full Screen Mode

Dual Display Format

The Site Master S331L can display two different measurements simultaneously by setting the Display Format to Dual and then selecting the measurement to display.

Note	Advanced measurements can be combined with Standard measurements.
	Not all measurement combinations may be supported by Line Sweep Tools. Refer to the Line Sweep Tools Help menu for more information.

Different Amplitudes, Limit Lines, and Markers can be set for each display. If the Marker Table is turned On in Dual Display Mode, then 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.
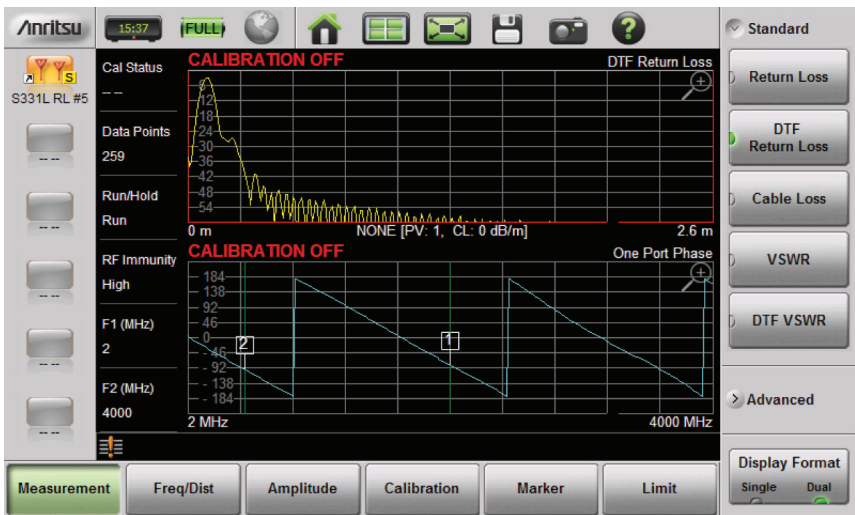
Figure 2-13.   Dual Display Format with Top Display Active

4. To maximize either the top display or bottom display while still in Dual display format, tap the magnifying glass symbol ⊕ in the upper-right corner of either graph. The graph will maximize, and the magnifying glass symbol will change from a (+) to a (–).

5. Figure 2-14 on page 2-23 shows the Top graph maximized. Tapping on the magnifying glass will restore the dual display.
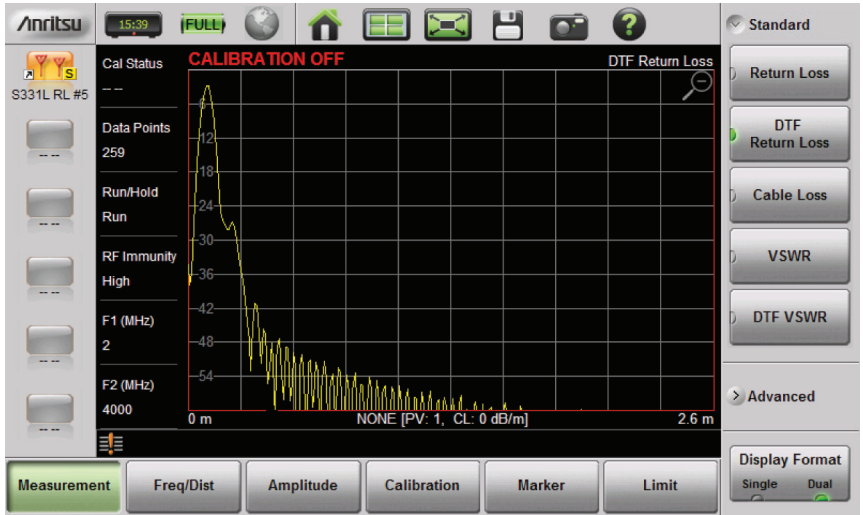
Figure 2-14.   Dual Display Format with Top Display Maximized

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 filename will contain references to both trace types, but you can change the name, as with any file. Refer to "Custom Name" on page 8-8.

Display Modes

In addition to the standard color display, the Site Master S331L offers the following Color Schemes:

Daytime for challenging daytime viewing conditions requiring increased contrast and brightness.

Nighttime optimized for night-time viewing with decreased contrast and brightness.

To change the display mode, **System** (8) > System Setups > Display/Audio and select one of the Color Schemes. Press **Enter** to set or **ESC** to cancel the display mode change.
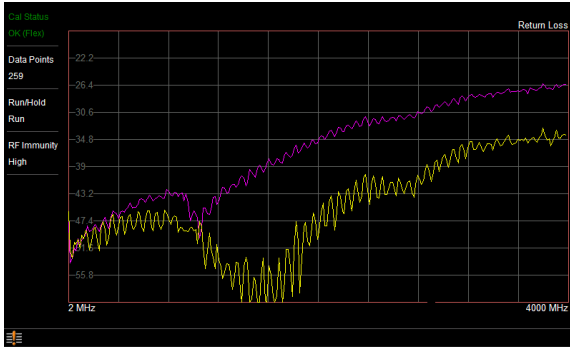
Standard
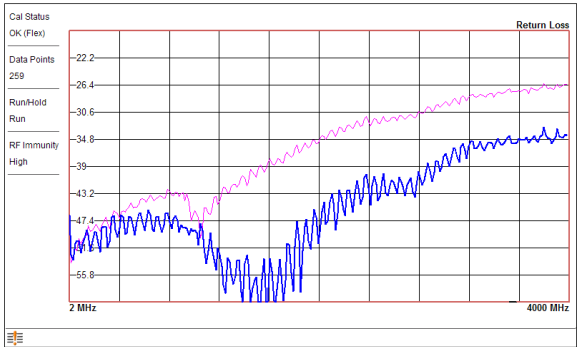
Daytime
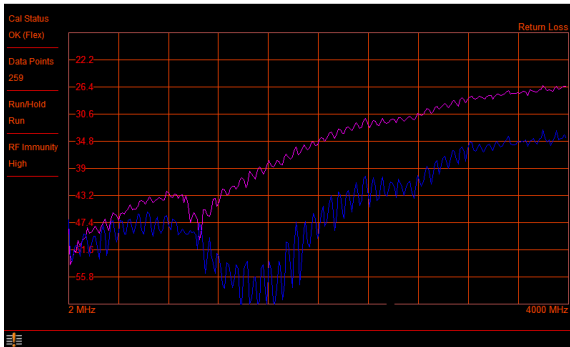
Nighttime

Figure 2-15. Site Master Color Schemes in Full Screen Mode

2-6 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)

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

Cal Status OK (RFP1)

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

Notes	Three calibration methods are supported by the instrument: **RFP1:** Full 1-port Reflection (OSL or InstaCal) **TRES:** Transmission (using External Sensor) **2PES:** Combined Full 1-port Reflection (OSL or InstaCal) and Transmission (using External Sensor) Standard or FlexCal calibration types can be performed with either the built-in InstaCal module or using external Anritsu OSL calibration components.

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 (↑°C)

The Site Master has been calibrated however the instrument temperature has drifted more than ±20 ºC since the last valid calibration was performed. A new calibration is required. For calibration procedures, refer to Chapter 7.

2-7   Soft Carrying Case

The soft carrying case (Figure 2-16) includes a detachable and adjustable carrying shoulder strap, which is connected to the D-rings of the case. For convenient use, connect the shoulder strap to opposite corners of the case and wear the strap around the neck with the unit hanging at waist height (Figure 2-17 on page 2-27).

Figure 2-16. Site Master in the Soft Carrying Case

Figure 2-17. Shoulder Strap

To install the Site Master into the soft carrying case:

1. Fully close the front panel of the soft carrying case and place the case face down on a stable surface.

2. Open the zipper closest to the D-rings on the sides and bottom of the soft case to install Site Master.

3. Insert the instrument face down into the case.

4. Close the zipper to secure the Site Master.

5. Turn the soft case over and open the front panel of the case to use the Site Master.

6. A tethered stylus pen to use with the touchscreen is stored inside the soft case on the top panel, near the RF ports. Store the stylus pen in the sleeve when not in use. Replacement stylus pens with the coiled tether cord are available from Anritsu. Refer to the Site Master data sheet (11410-00616).

Note	The grey nylon pull tab at the rear bottom of the case opens the tilt bail support panel. Adjust the open tilt angle with the hook-and-loop fastener strap. This support panel also contains two storage pockets that provide convenient and secure storage for calibration components and adapters.

Chapter 3 — Cable and Antenna Measurements

3-1 Overview

This chapter provides an overview of 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.
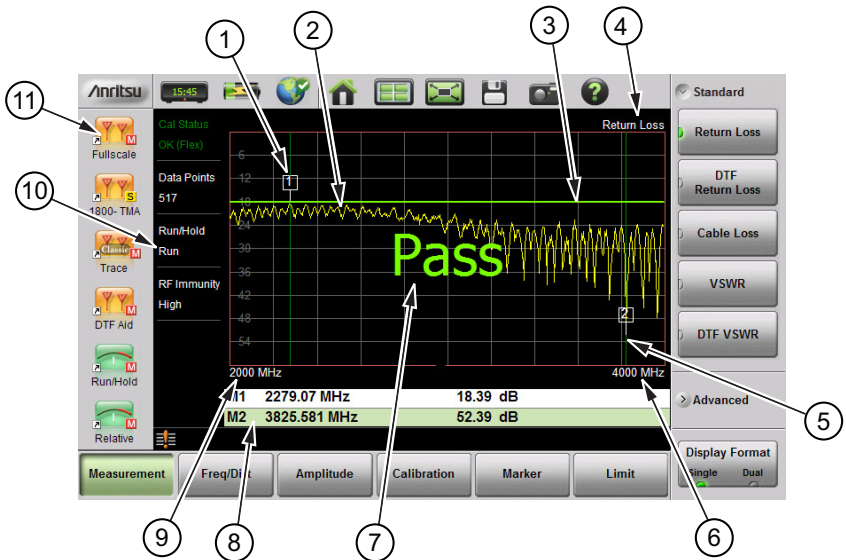
1	Marker 1 (Marker to Peak)
2	Active Trace (Yellow)
3	Limit Line (Green when Passing)

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

4	Measurement Type
5	Marker 2 (Marker to Valley)
6	Stop Frequency (F2)
7	Pass Message (Active trace is below the limit line in Return Loss measurement)
8	Marker Table
9	Start Frequency
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. 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 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/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

What is Measured?

Line sweeping is a quality measure of the transmission lines and/or antenna system. Systems may include cables, connectors, lightning protectors, tower mounted amplifiers, and antennas (Figure 3-2). Line sweeping can measure the power losses in the system at the functional frequencies and measures system impedance and confirms whether the system meets carrier specifications.

If the system does not meet specification, line sweeping can also locate components that are reflecting power above specified levels.
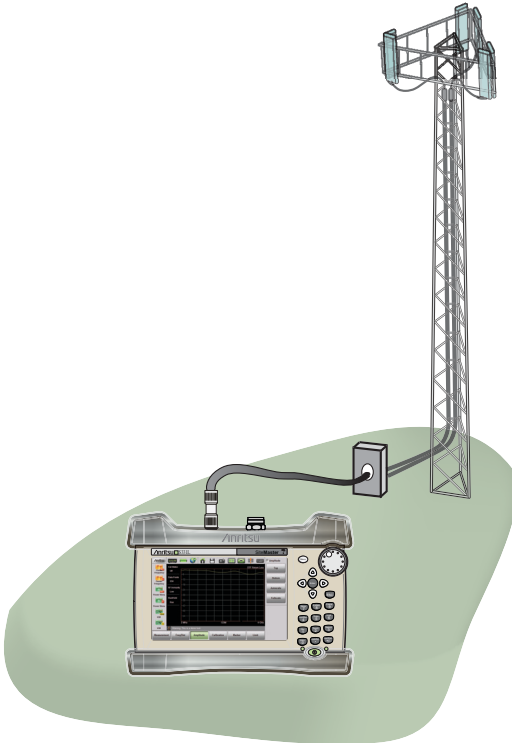
Figure 3-2.   Cable and Antenna Line Sweeping

Note	The Site Master does not measure system linearity (PIM Testing). Anritsu also sells the PIM Master available in several carrier bands that does test for passive intermodulation.

Why Measure?

The basic goal of a wireless communication system is to transfer the maximum amount of RF energy to achieve coverage (Figure 3-3). Wireless communication systems require good integration of all components from the ground to the antenna. Problems such as dented shielding, bad connectors, water ingress, or over torque will cause a mismatch and reflect power.

Return Loss: 10 dB
10% power reflected
Incomplete Coverage

Return Loss: 20 dB
1% power reflected
Complete Coverage
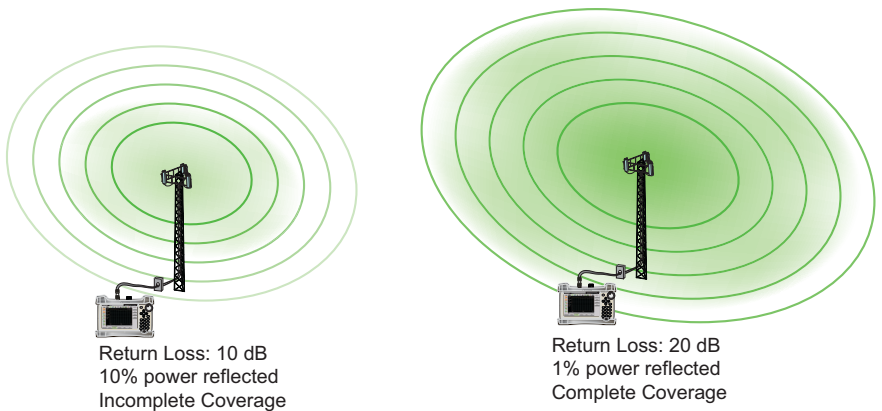
Figure 3-3.   Coverage Area

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 3-4 shows a failed Return Loss measurement with the pass/fail limit line and Figure 3-5 on page 3-7 is a Distance to Fault measurement of the same system.
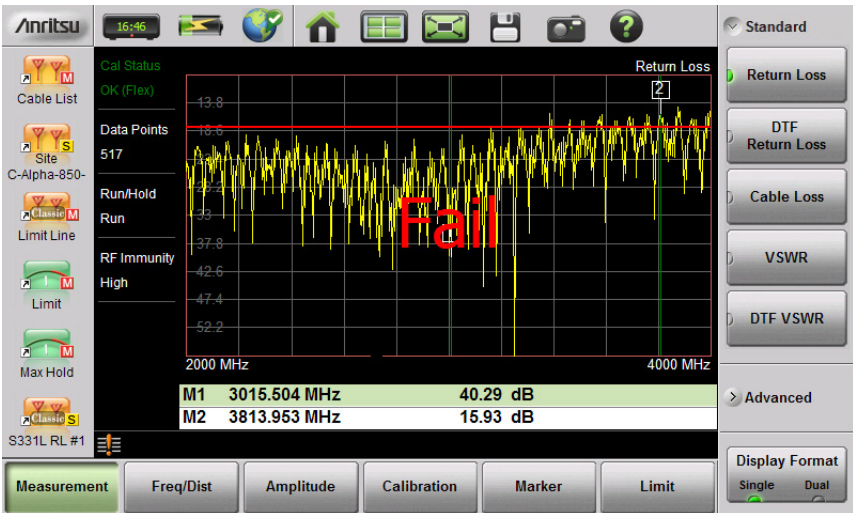
Figure 3-4.   Failed Return Loss Measurement
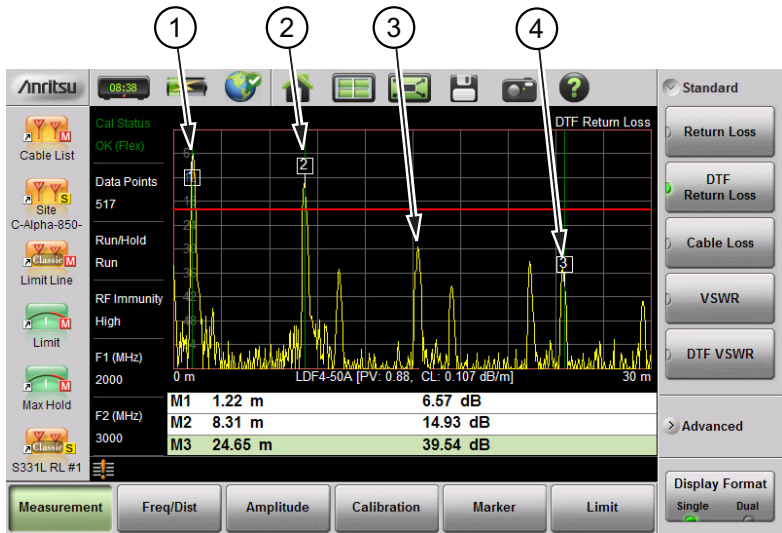
1	Failure at Jumper (1.22 m)
2	Possible Failure at 8.31 m
3	Example of Good Connector (~30 dB)
4	Precision Load Connected at End of Cable (24.65 m)

Figure 3-5. Distance to Fault Measurement Shows the Failing Components

The second common Line Sweeping measurement is Cable Loss (Figure 3-6 on page 3-8). 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 loss specifications for many cable types preinstalled.

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.
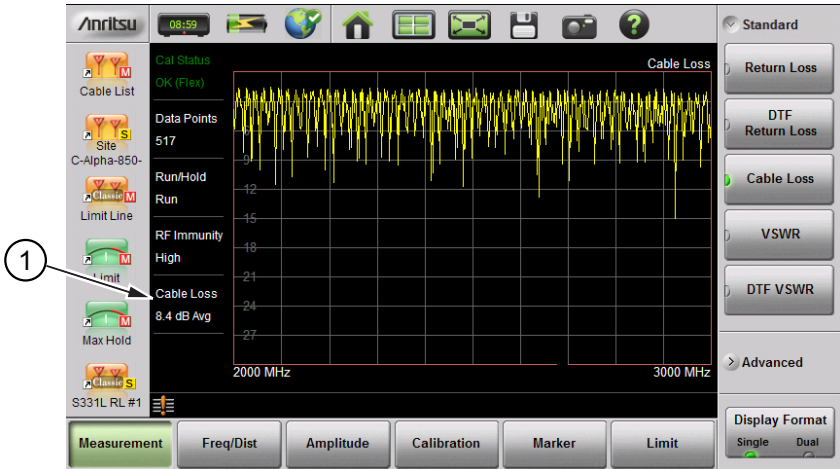
| 1 | Average Cable Loss |

Figure 3-6.   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. Alternatively, you can use the *internal* InstaCal. The *external* InstaCal Calibration Module is *NOT* compatible with the Site Master S331L. For Transmission measurements, the external USB sensor itself is used as part of the calibration step, and no additional components are needed.

The instrument must be re-calibrated whenever the temperature exceeds the calibration temperature range window or when the test port extension cable is removed or replaced. Unless the calibration type is FlexCal, the instrument must also be re-calibrated every time the setup frequency changes. Refer to Chapter 7 for details on how to perform a calibration.

Note	Anritsu recommends allowing the S331L 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 ºC 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 are required:

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

The measurements for these sweeps are defined as

- Return Loss - System Sweep
- DTF - Load Sweep
- Cable Loss Sweep

Return Loss / VSWR Measurement

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.

Cable Loss Measurement

Measures the energy absorbed, or lost, by the transmission line in dB/meter or dB/ft. Different transmission lines have different losses, and the loss is frequency and distance specific. The higher the frequency or longer the distance, the greater the loss.

Distance-To-Fault (DTF) 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.

Line Sweep Measurement Types

Return Loss – System Sweep

A measurement made when the antenna is connected at the end of the transmission line. This measurement provides an analysis of how the various components of the system are interacting and provides an aggregate return loss of the entire system.

Distance To Fault – Load Sweep

A measurement is 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.

Cable Loss Sweep

A measurement made when a short is connected at the end of the transmission line. This condition 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.

This whole process of measurements and testing the transmission line system is called Line Sweeping.

3-5   Typical Measurements

This section details the typical line sweep measurements used to analyze the performance of a transmission feed line system including Return Loss, Cable Loss, and DTF.

Note	Anritsu recommends using a phase-stable test port cable when making Cable and Antenna measurements. Attach the cable to the RF Out/Reflect In connector of the Site Master and calibrate at the open end of the cable.

Return Loss or VSWR Measurement

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.

System Return Loss measurement verifies the performance of the transmission feed line system with the antenna connected at the end of the transmission line. Figure 3-7 and Figure 3-8 show a sample antenna measured using Return Loss and again using VSWR.
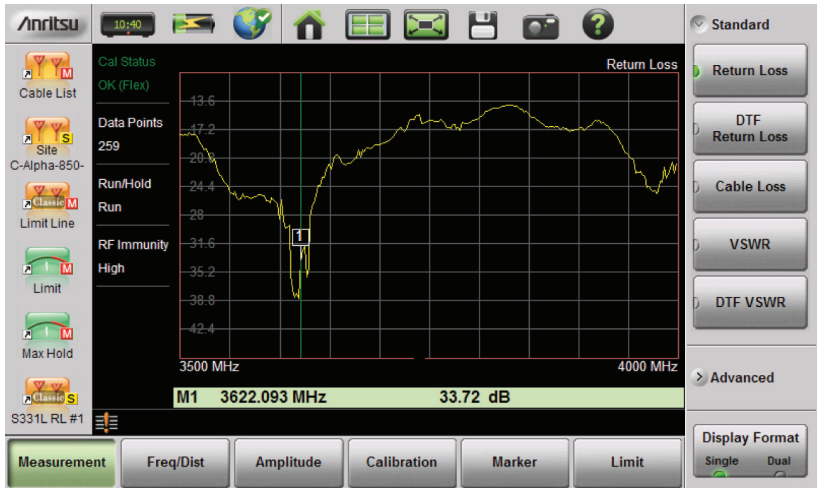
Figure 3-7.   Antenna Return Loss Trace
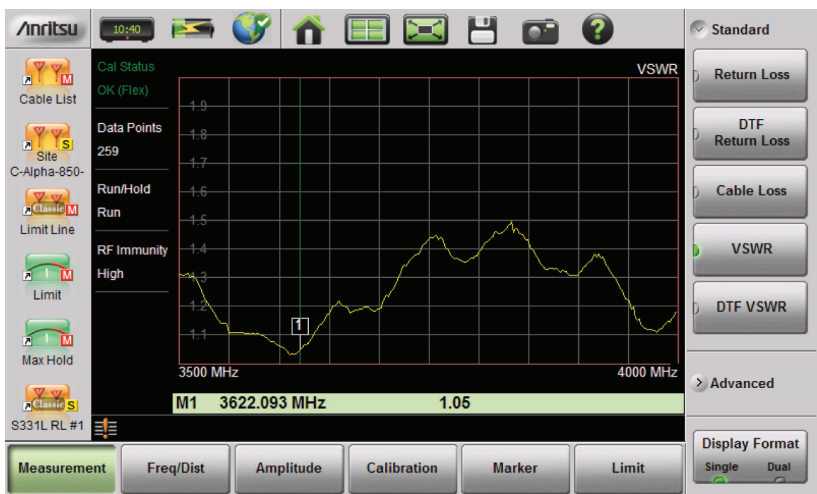
Figure 3-8.   Same Antenna Trace in VSWR

Device Under Test: Feed line with Antenna

1. Press the **Measurement** main menu key and select Return Loss or VSWR.

2. Press the **Freq/Dist** main menu key and enter the start and stop frequencies.

3. Press the **Amplitude** main menu key and enter the top and bottom values 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. See Chapter 7 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 3-38.

7. Press the **Limit** main menu key to enter and set the limit line as described in "Limit Lines" on page 3-32.

8. Press **Save** (7) then Save to save the measurement to memory. Refer to Chapter 8 for details on setting the save location.

Cable Loss Measurement

The transmission feed line insertion loss test verifies the signal attenuation level of the cable system in reference to the specification. The average cable loss of the frequency range is displayed on the screen in the measurement settings summary area.

Device Under Test: Transmission Feed line with Short

1. Press the **Measurement** main menu key and select Cable Loss.

2. Press the **Freq/Dist** main menu key and enter start and stop frequencies.

3. Press the **Amplitude** main menu key and enter top and bottom values for the display or press Full Scale.

4. Press the **Calibration** main menu key to start calibration of the instrument. Anritsu suggests using a phase-stable test port cable. See Chapter 7 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 to enter and set the limit line as described in "Limit Lines" on page 3-32. 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 to memory. Refer to "Save Files" on page 8-2 for details on setting the save location.
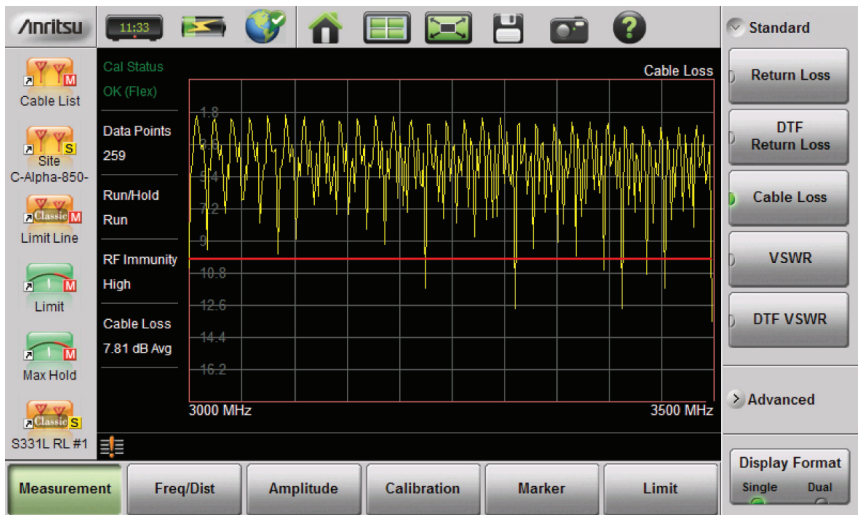
Figure 3-9.   Cable Loss Measurement

Distance-To-Fault (DTF)

DTF 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.

Using DTF Aid

Because of the nature of the measurement, maximum distance range and distance resolution is dependent upon the frequency range and number of data points. DTF Aid (**Freq/Distance** > Distance > DTF Aid) shown in Figure 3-10 explains how the parameters are related.
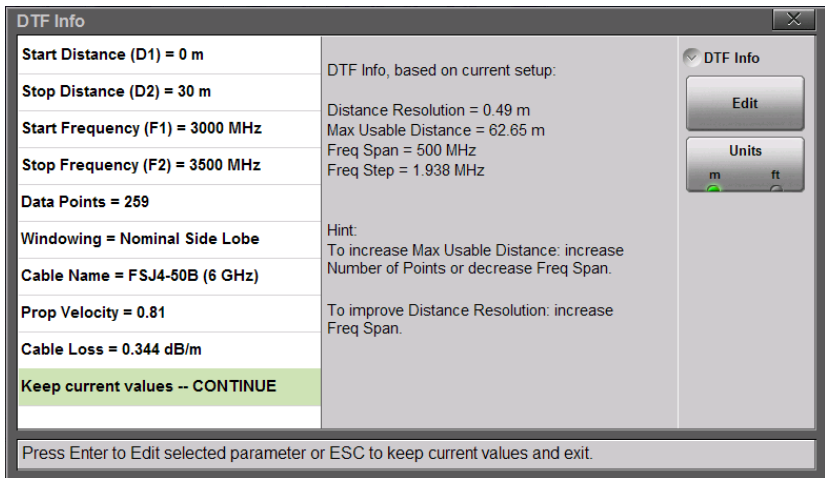
Figure 3-10. DTF Aid

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 S331L 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 cables 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's Help menu. The latest version of LST is available from the Anritsu web site: http://www.anritsu.com/.

The name, propagation velocity, and cable loss of the selected cable is displayed below the graticle during distance measurements (**Measurement** > DTF Return Loss or DTF VSWR) as shown in Figure 3-11.
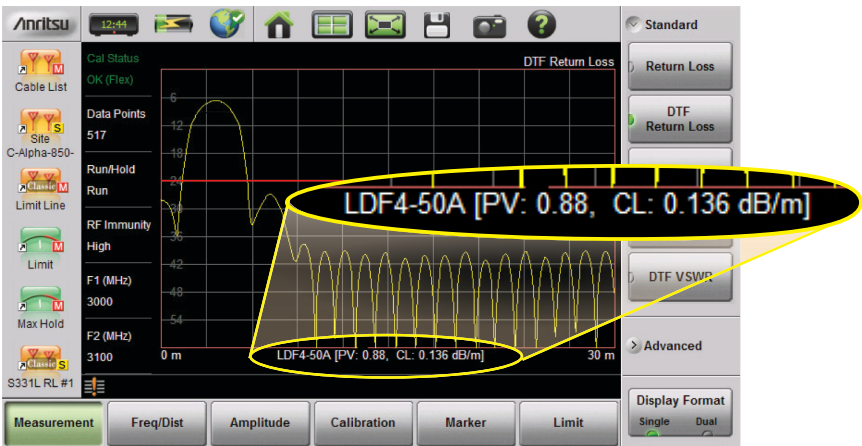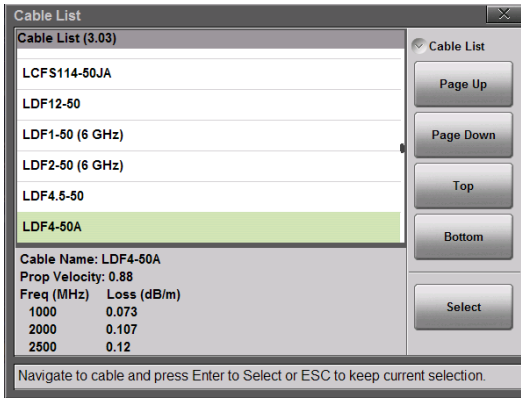
Figure 3-11. Cable List Selection Displayed Under Graticle

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.

Distance Resolution (m) = 300 x pv / ΔF (MHz)

Figure 3-12 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.
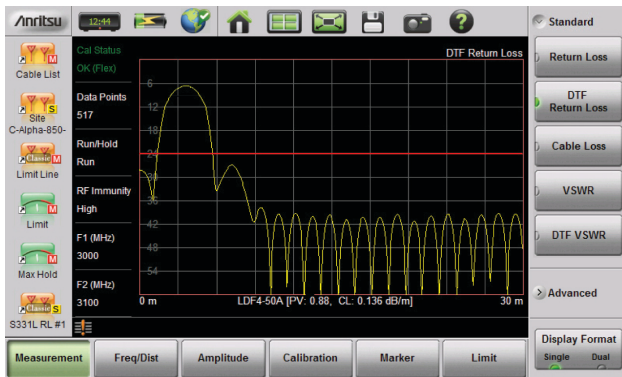
100 MHz Span
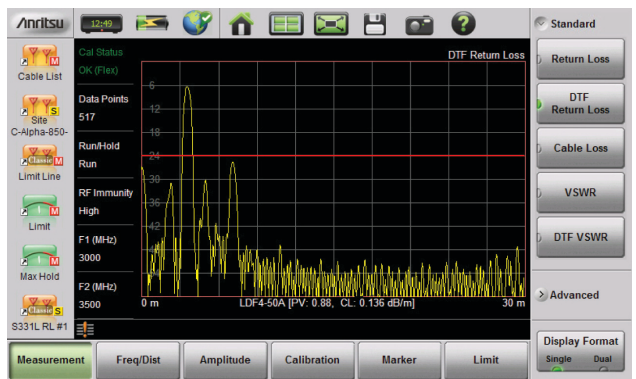
500 MHz Span

Figure 3-12. 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 the end of the frequency sweep. As the side lobes are reduced, the main lobe widens, thereby 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 near to each other, then spectral resolution is important. In this case, use Rectangular Windowing for the sharpest main lobe (the best resolution).

In summary:

- 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.*
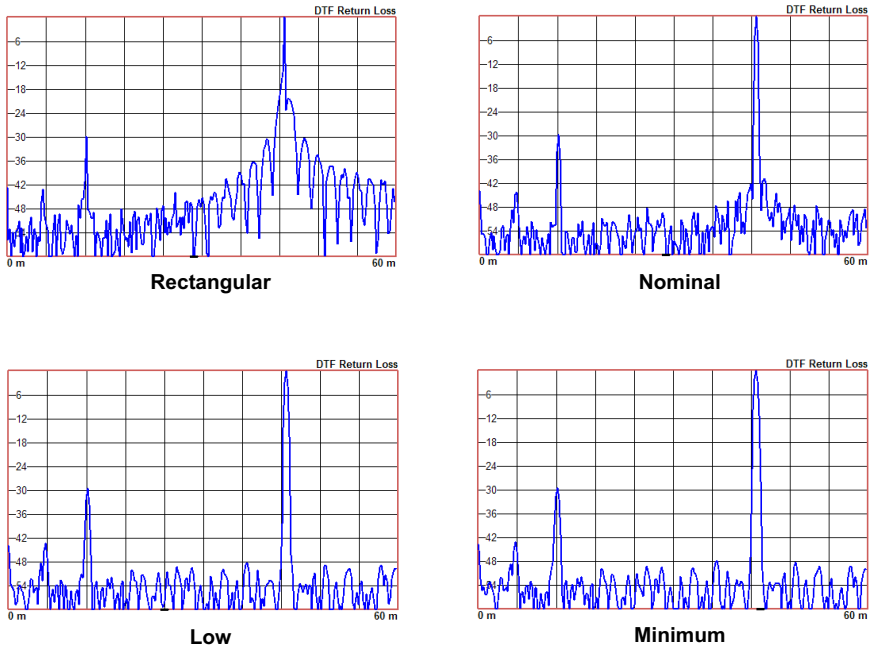
Figure 3-13. Effects of Windowing on a Sample Trace

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 = (Datapoints – 1) x Distance Resolution

3-6   Distance to Fault

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 submenu key and then select DTF Aid. Use the touchscreen, rotary knob, or **Up/Down** arrow keys to navigate through all the DTF parameters.

   a. Highlight a parameter in the DTF Aid table to edit and then press Edit or **Enter** to display a parameter for editing.

   b. Edit all required parameters and then highlight Keep current values -- CONTINUE and press **Enter**.

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

4. Connect a phase-stable Test Port cable to the RF Out/Reflect In connector on the Site Master. Press the **Calibration** main menu key to start calibration of the instrument. Refer to Chapter 7 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 3-14 on page 3-21 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).
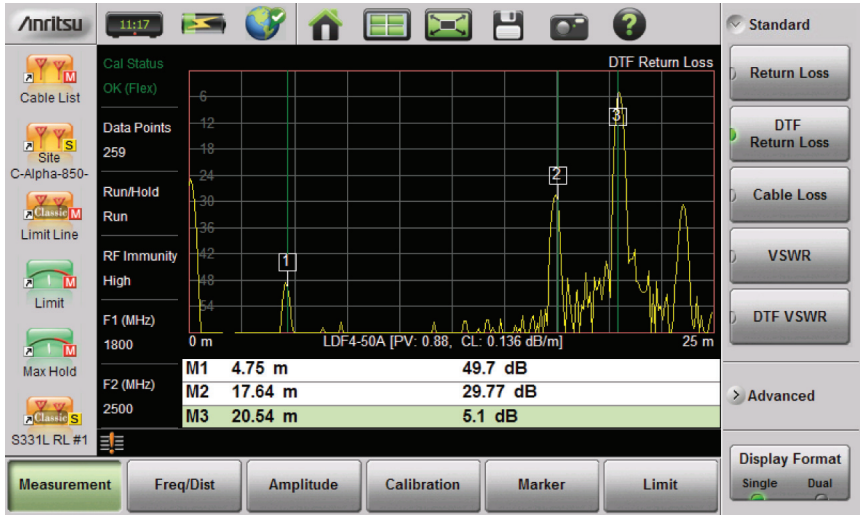
Figure 3-14. DTF Return Loss with a Short at the End of the Cable
(20.5 m)

Note	In Figure 3-14, 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 3-15 on page 3-22 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 3-16 on page 3-22).
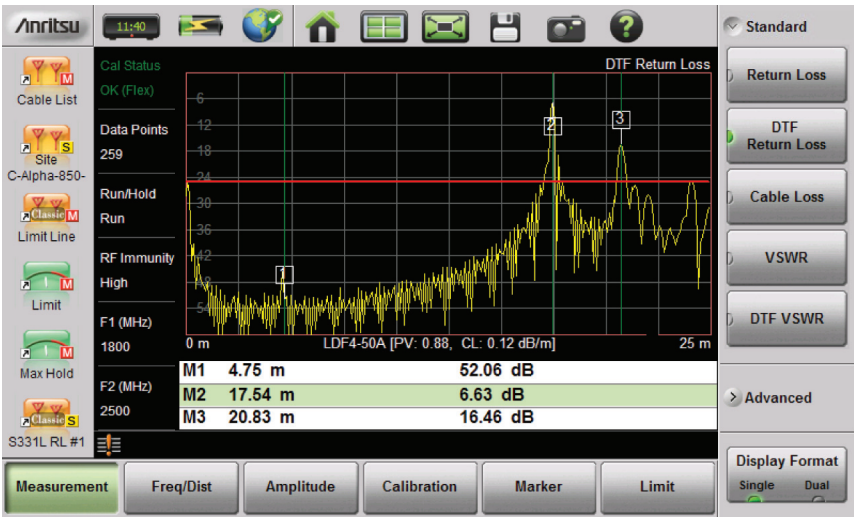
Figure 3-15. DTF Return Loss Measurement (Antenna at 20.83 m)
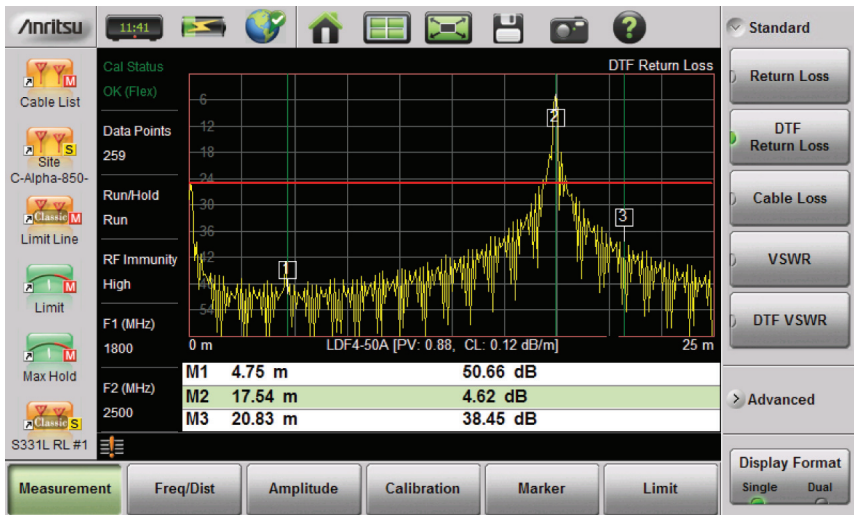
Figure 3-16. Failing DTF Return Loss Measurement (Load at 20.83 m)

The jumper connector at 17.5 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 3-17).
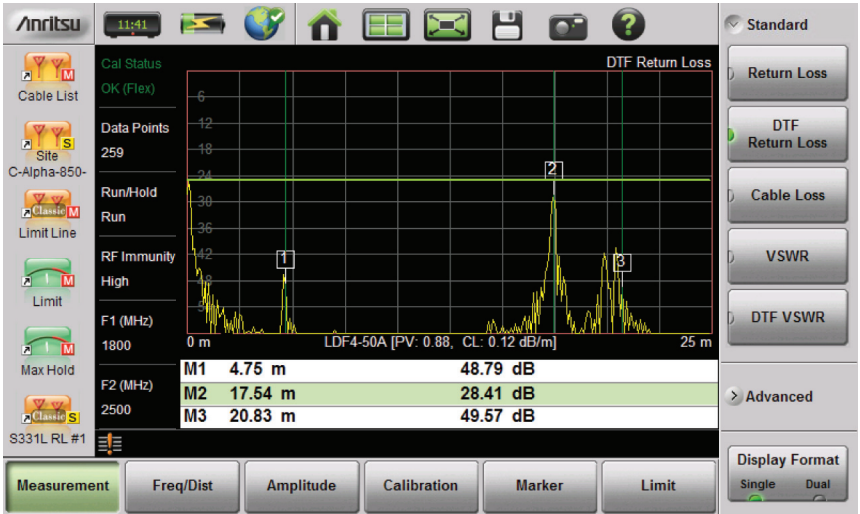
Figure 3-17. Passing DTF Return Loss Measurement (Load at 20.83 m)

Figure 3-18 shows the same system with the antenna reattached. The reflection of the jumper connector in now reduced to 27.64 dB.
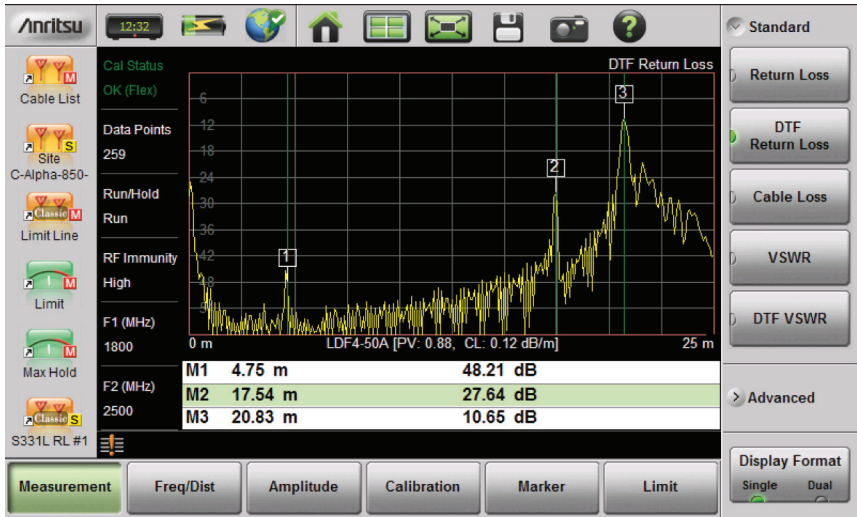
Figure 3-18. DTF Return Loss Measurement (Antenna at 20.83 m)

3-7   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 3-19. 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 3-20 and refer to "Amplitude Menu" on page 3-58.
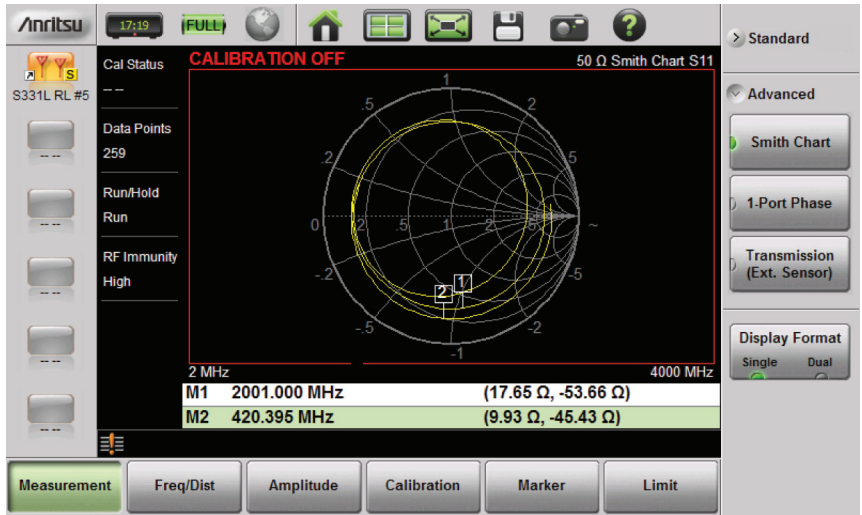
Figure 3-19. Smith Chart Measurement
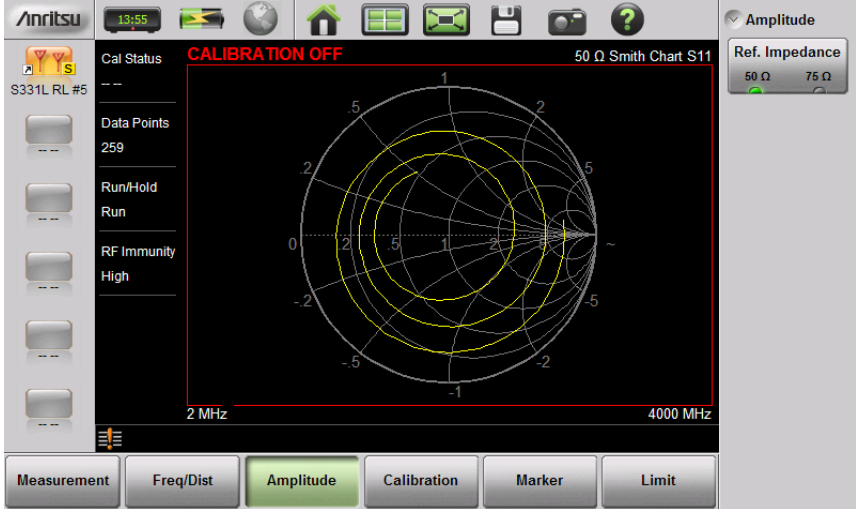
Figure 3-20. Set Reference Impedance for Smith Chart Calculations

1-Port Phase

The S331L can display the phase of the reflection measurements at the RF Out/Reflect In 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).
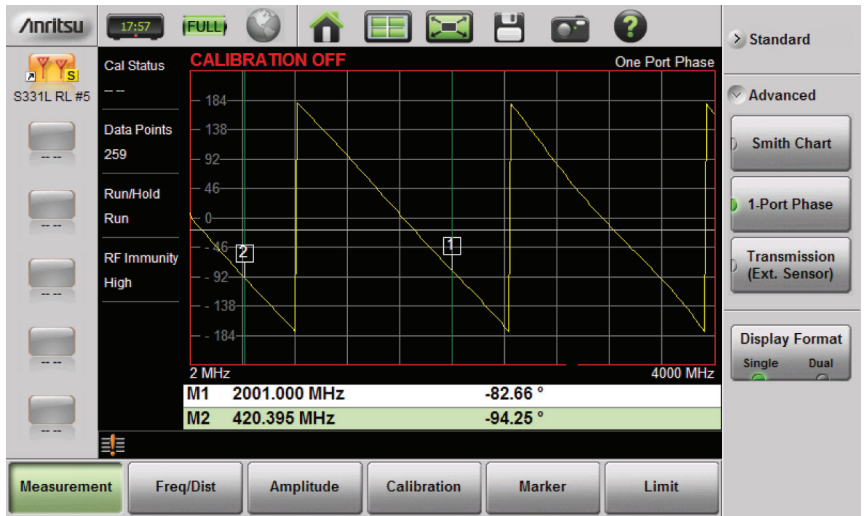
Figure 3-21. 1-Port Phase Measurement

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 Out/Reflect In port of the Site Master, and connect a USB power sensor to the other end of the cable. USB extenders can be used for long cable runs. This measurement provides 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 3-22 is a cable loss measurement example of an external sensor transmission.
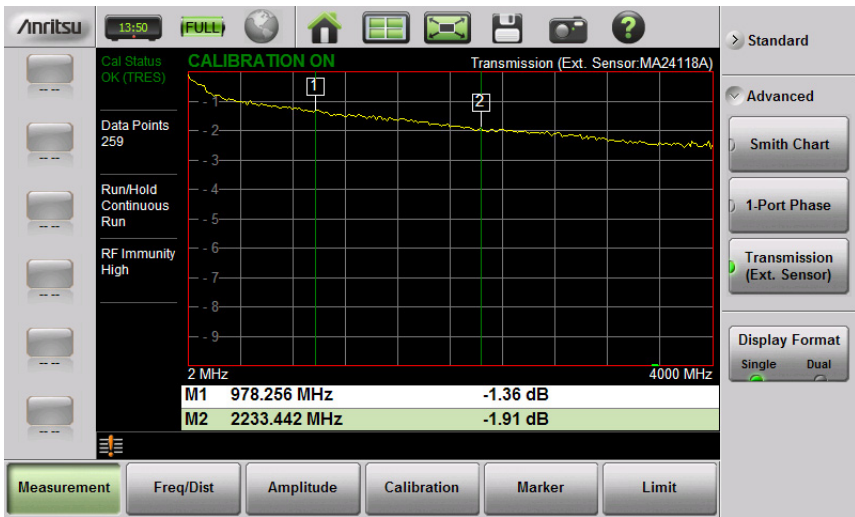
Figure 3-22. External Sensor Transmission Measurement

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 the external USB sensors that are supported by the S331L for transmission measurements, see the S331L Technical Data Sheet.

3-8   Measurement Setup

This section describes how to set up the Cable and Antenna parameters, markers, and limit lines.

Frequency

Setting up the Measurement Frequency using Start and Stop Frequencies

1. Press the **Freq/Dist** main menu key then Frequency if the menu is collapsed.

2. Press the Start Freq submenu key and enter the start frequency using the **Up/Down** arrow keys, rotary knob or keypad. When using the keypad, the button labels change to GHz, MHz, kHz, and Hz. Press the appropriate unit key to complete the entry.

3. Press Stop Freq and enter the stop frequency.

Distance

1. Press the **Freq/Dist** main menu key and then Distance if the menu is collapsed.

2. Press the Start Distance submenu key and enter the start distance using the **Up/Down** arrow keys, rotary knob or keypad. When entering a distance using the keypad, press the unit key to complete the entry.

3. Press Stop Dist and enter the stop distance.

DTF Aid

Refer to .

Amplitude

Setting the Amplitude using Top and Bottom Keys

1. Press the **Amplitude** main menu key.

2. Press the Top submenu key and use the keypad, rotary knob, or the **Up/Down** arrow key to edit the top scale value. Press **Enter** to set.

3. Press the Bottom key and use the keypad, rotary knob, or the **Up/Down** arrow key to edit the bottom scale value. Press **Enter** to set.

Setting the Amplitude using 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

To automatically set the scale to the default setting, press the Fullscale key. 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 3-58 for additional information.

Sweep

The **Sweep** 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) menu key then press Data Points.

  2. Select 130, 259, 517, 1033, or 2065 data points.

Refer to "Sweep Menu" on page 3-65 for additional information about the **Sweep** 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

Controls if the instrument is actively sweeping the frequency range. When Sweep Type is set to Single mode, this key also provides a single sweep trigger.

    1. Press the **Sweep** (3) menu key.

    2. Toggle the Run/Hold key.

Sweep Type

Toggles the sweep between single sweep and continuous sweep. In single sweep mode, each sweep is activated by the Run/Hold key.

    1. Press the **Sweep** (3) menu key.

    2. Toggle the Sweep Type key between Single and Continuous.

RF Immunity

The instrument defaults to RF Immunity High. This setting protects the instrument from stray signals generated by nearby or co-located transmitters that can affect frequency and DTF measurements. The algorithm used to improve instrument's ability to reject unwanted signals slows down the sweep speed. If the instrument is used in an environment where immunity is not an issue, the RF Immunity key can be set to Low to optimize sweep speed. Use this feature with caution, as the introduction of an interfering signal might be mistaken for a problem with the antenna or cable run. If Immunity is set to Low during a normal Return Loss or VSWR measurement, the instrument will be more susceptible to interfering signals. Interfering signals can make the measurement look better or worse than it really is.

    1. Press the **Sweep** (3) menu key.

    2. Toggle RF Immunity between High and Low.

RF Pwr In Hold

This setting determines if the RF output power at the RF Out/Reflect In port stays On or is turned Off when the instrument's Run/Hold setting is toggled to Hold. When RF Pwr In Hold is Off, the power at the port is turned off when the instrument is placed in Hold mode and not sweeping.

Power at the port is resumed when the Run/Hold setting is toggled back to Run.

This is useful for users who may not want a signal radiating out of the port at all times.

Limit Lines

Limit lines are used for visual reference or for pass/fail criteria using the limit alarm and pass/fail message setting. 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.
- Select the **Limit** main menu key before trying to move a limit line using the touchscreen.
- 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 amplitude, limit alarm, and the Pass/Fail message.

Limit Line Functions

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

   The limit line can be set as a single or a segmented limit. 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 both are Single, or both are Segmented.

2. Press Move Active Limit to set the limit line value by using the **Up/Down Arrow** keys, rotary knob, or numeric keypad.

Note	Limit lines cannot be moved by using the touchscreen.

3. For segmented limit lines, press Edit Segments to display the
Segments menu. A table displays active limit line segments.

4. Tap on a limit line segment and 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 Escape (**ESC**) key to close the Edit Segments menu 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.
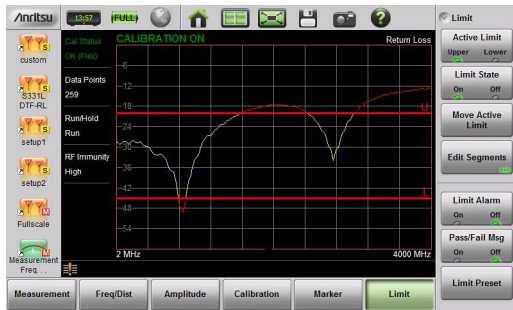
Figure 3-23. Limit Lines and Trace Showing Fail Colors

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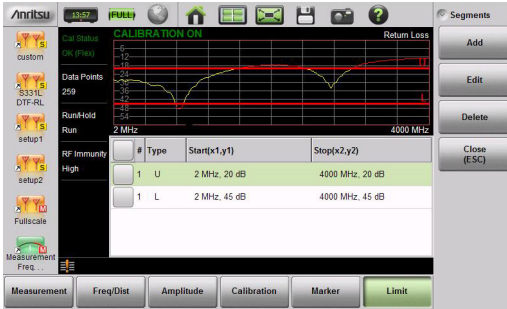
Figure 3-24. Table of Limit Lines (or Segments)

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.
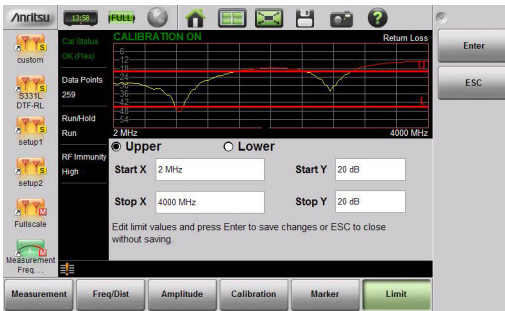
Figure 3-25. Segment Editing Dialog Box

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.
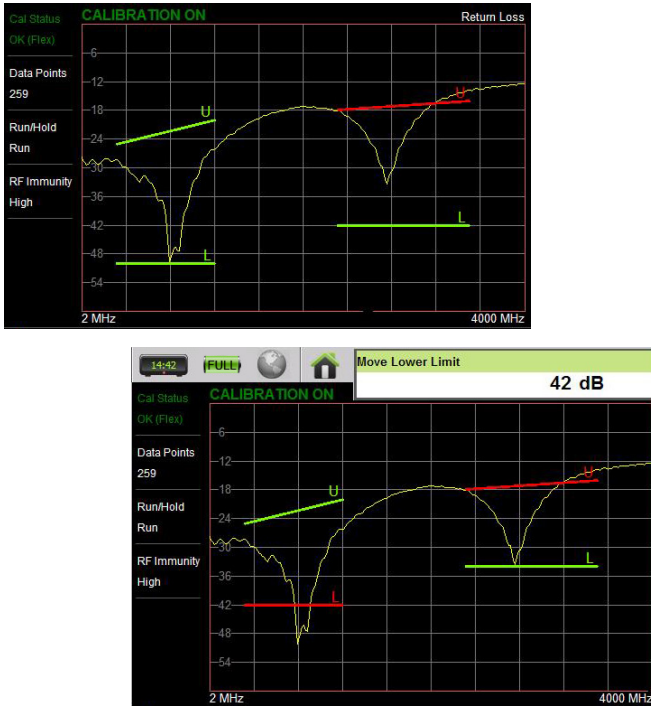
Figure 3-27. Moving Limit Line Segments

Limit Alarm

1. Press the Limit Alarm key to turn on or off the audible Limit Alarm.

2. Adjust the volume of the limit alarm by pressing **System** (**8**), then System Setups. Press the Display/Audio key and then Volume. Adjust the volume with the Up/Down arrow keys, rotary knob, or the touchscreen. Press Enter to apply the new setting.

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.
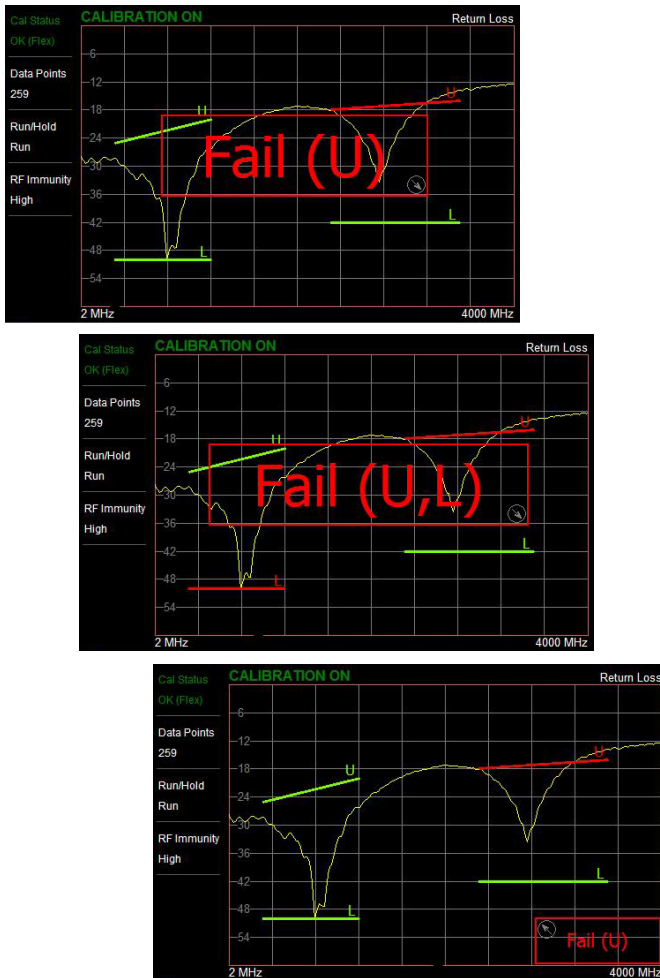
Figure 3-28. Pass/Fail Message Turned On

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.

- Press and hold on a marker to select and display the frequency/
  distance and amplitude information, drag a marker to move it.

- The selected marker displays a red line and is the highlighted row
  in the marker table. Select a marker to edit with the touchscreen
  or the Select Marker button.

- Selected markers can be quickly dragged to a new location using
  the touchscreen or moved by double-tapping on the display.

- Markers can be selected (and moved) outside of the **Marker** menu.
  Press and hold on a marker (thin green line) for a few seconds to
  make it active and ready for moving. After a few seconds the
  instrument will automatically deselect the marker.

- Markers set beyond the current frequency or distance range are
  displayed at either the left or right of the graticule.

- If the frequency (F1 or F2) or distance (D1 and D2) parameters
  are moved inside a current marker location, the out range
  (---> or <----) indicator is displayed and marker values in the
  Table are blanked (--). See Figure 3-29 for an example of markers
  beyond the current span.

- Markers beyond the current span cannot be edited.

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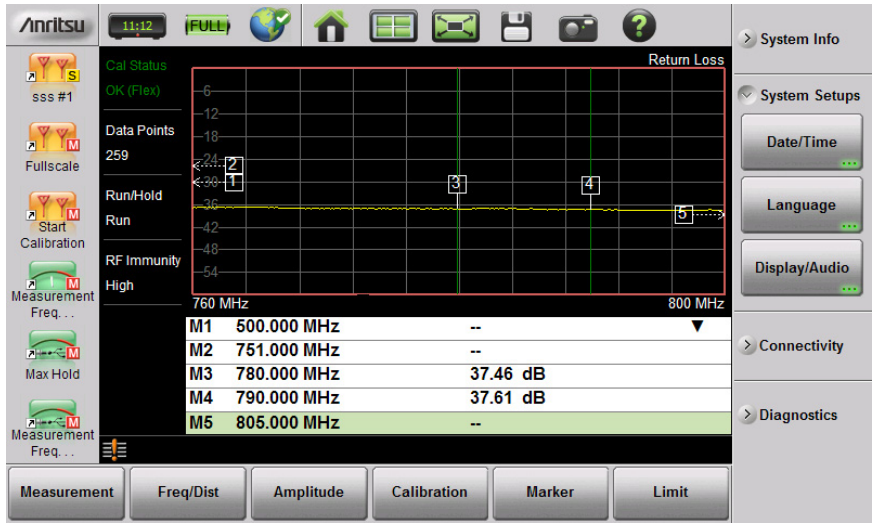
Figure 3-29. Markers 1, 2, and 5 are Out of Range

Select, Activate, and Place a Marker / Delta Marker

1. Press the **Marker** main menu key. One of the markers is automatically selected. Select a different marker with the Select(1-8) button. Press one of the Marker buttons to turn the marker on and make the marker active. The active marker is red.

2. Press the Edit menu and use the Up/Down arrow keys, the keypad, the rotary knob, or the touchscreen to move the marker.

3. 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. illustrates using a delta marker to estimate the passband of a filter.

Marker Table

The Marker Table displays below the sweep window. The table is automatically sized to display all markers that are turned on. The table displays marker frequency/distance, amplitude and delta information for delta markers. To display the marker table:

1. Press the **Marker** main menu key, then Display. Select Mkr + Table.
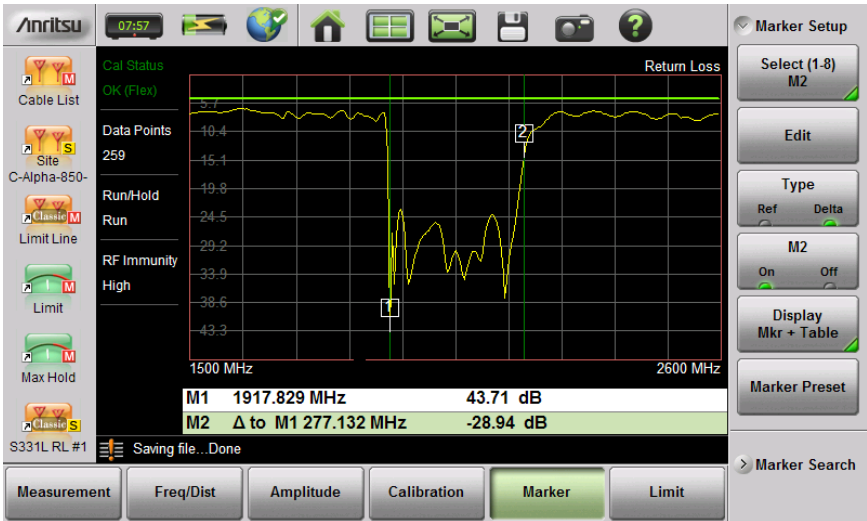
Figure 3-30. Delta Marker 2 and Marker Table

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. Select the marker to use for peak or valley.

2. Press Marker Search.

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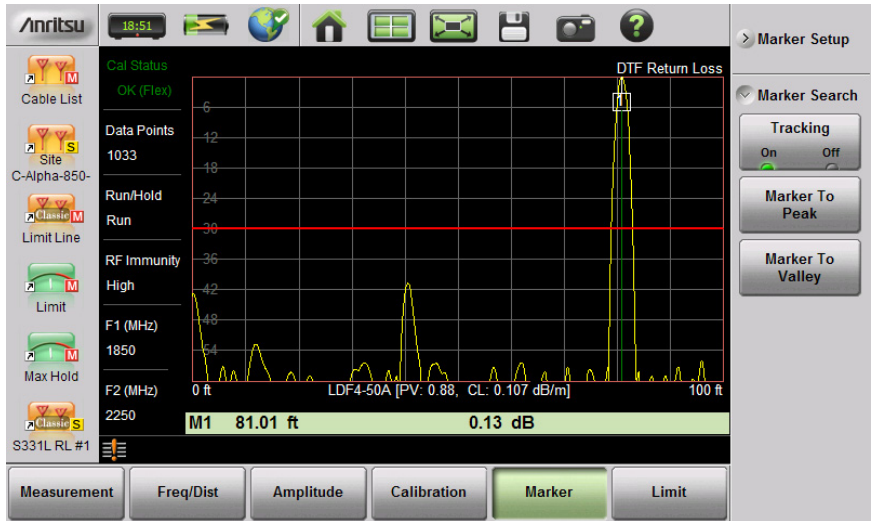
Figure 3-31. Marker Search, Marker 1 Set to Peak

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.

   1. Press the **Marker** main menu key set the locations for Marker 3 and Marker 4. Refer to "Select, Activate, and Place a Marker / Delta Marker" on page 3-39 for details.

   2. Select Marker 5.

   3. Press Marker Search and select Peak between M1 & M2 or Valley Between M1 & M2. Marker 5 will now move to the peak or valley between M1 and M2.

   4. In Figure 3-32 on page 3-42, Marker 5 moved to the valley bounded by M1 and M2 instead of the lowest point (48 dB) to the left of Marker 1. The valley search would also work if M1 and M2 were set and then turned off.
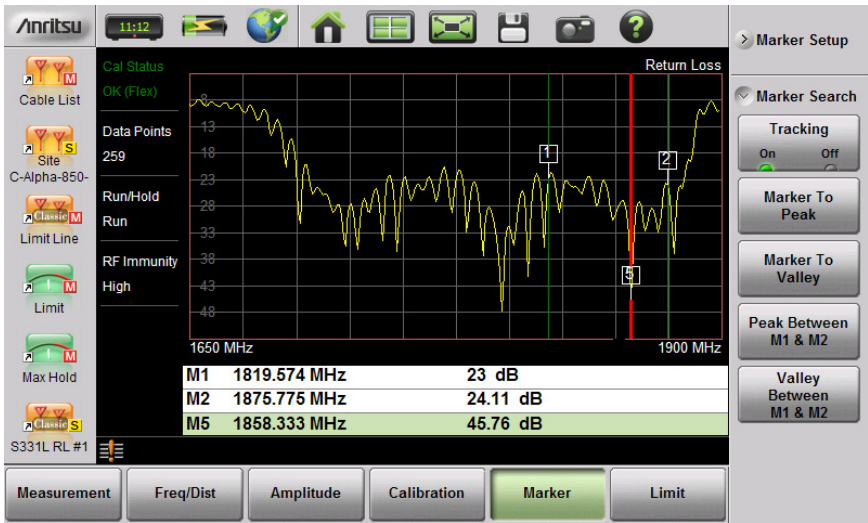
Figure 3-32. Bounded Marker Search

Note	Searching for peaks or valleys turns on any required markers and place them in the default locations.

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.
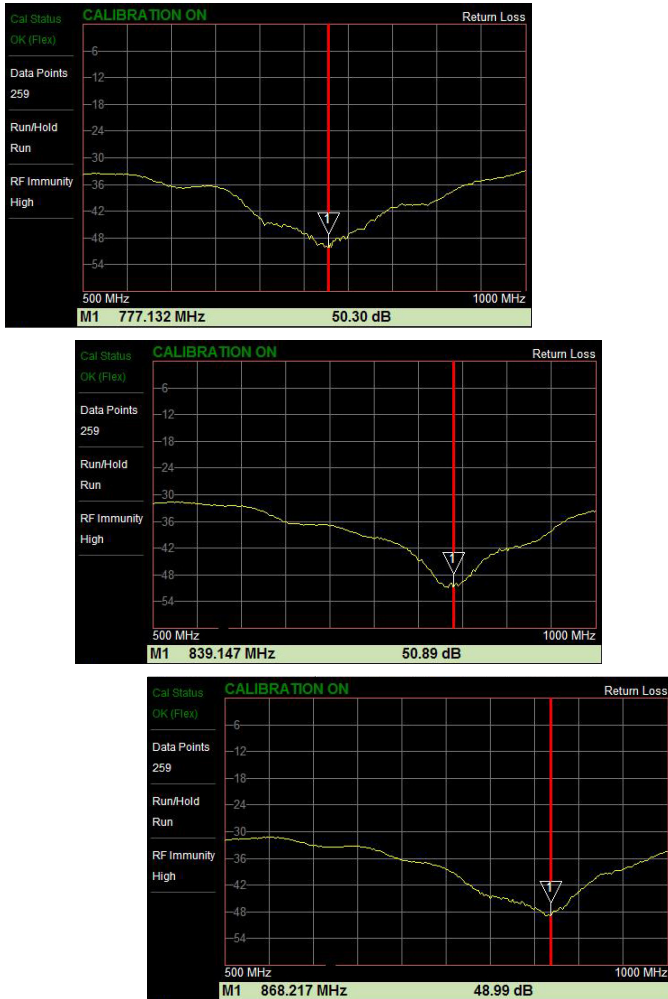
Figure 3-33. Tracking Marker Set to Valley

In Figure 3-34, Marker M5 is set for Tracking a Valley between markers
M1 and M2. Marker M6 is Tracking a Valley between markers M3 and
M4. The table of markers (below the sweep window in Figure 3-34)
shows only 4 markers, but the table can be expanded or reduced by
tapping on the table.
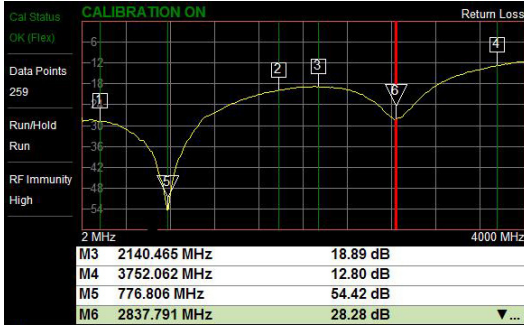
Figure 3-34. Tracking a Valley Between Markers

3-9   Trace

The Site Master S331L 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) from internal memory or a USB stick 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.
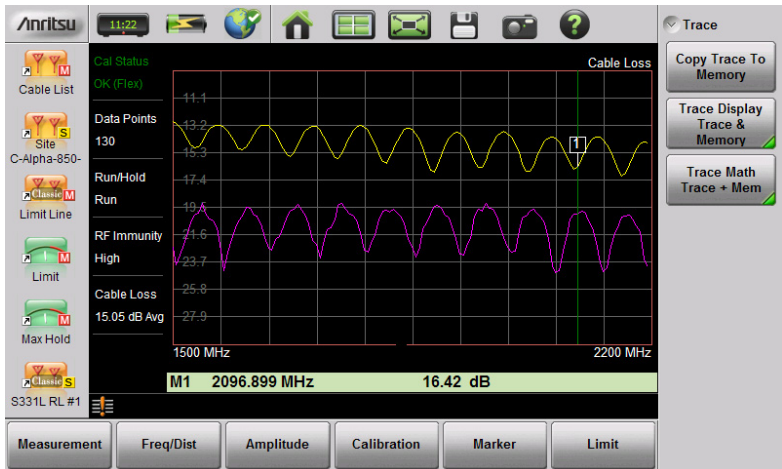
Figure 3-35. Displaying a Live Trace and a Static Trace from Trace Memory

From the **Trace** menu users can Copy Trace to Display Memory. The copied trace can be displayed on the Site Master and used for trace math. Trace Display allows viewing of two traces at the same time 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 3-29 for additional information.

1. Press **Trace** (5) and 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.
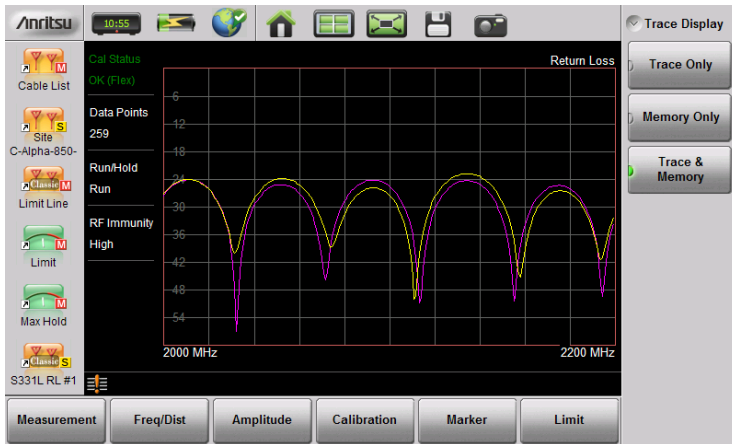
Figure 3-36. Trace Overlay of Two Cables

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 3-46.

2. Press Trace Math and select Trace - Mem , Trace + Mem, or (Trc + Mem) / 2 (Figure 3-37).

Live Trace (Yellow)

Memory Trace (Purple)
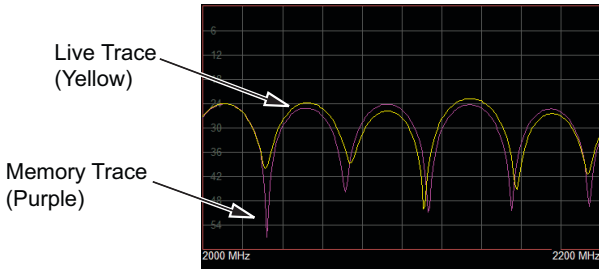
Example A. Sample Traces
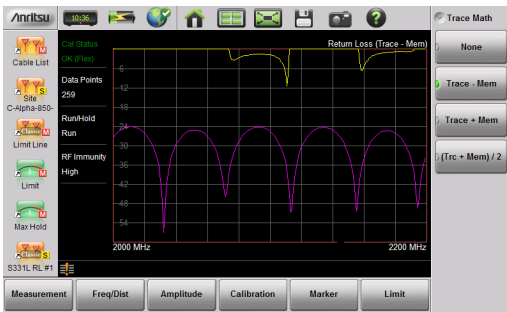
Example B. Trace - Memory
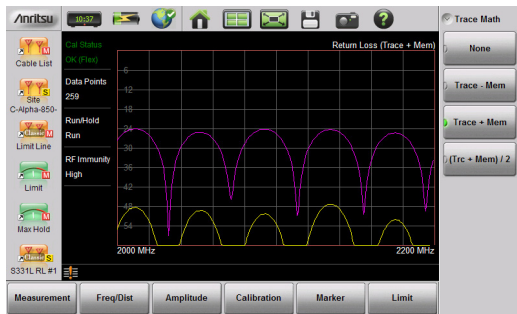
Example C. Trace + Memory

Figure 3-37. 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 3-37	**Example Description**
A. Sample Traces	Shows the live yellow trace and purple memory trace.
B. Trace - Memory	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).
	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).
	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.
C. Trace + Memory	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).
	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).

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

Example from Figure 3-37	Example Description
(Trace + Memory) / 2 *(not shown)*	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.
	This math function is most useful when measuring one-port Cable Loss (using the Cable Loss measurement).
	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.
	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.

Refer to "Trace Menu" on page 3-66 for additional information.

3-10   Measurement Review

Table 3-2 provides 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

3-11 C&A Menus

Figure 3-38 and Figure 3-39 show the map of the Cable and Antenna
Analyzer menus. The following sections describe main menus and
associated submenus. The submenus are listed in the order they appear
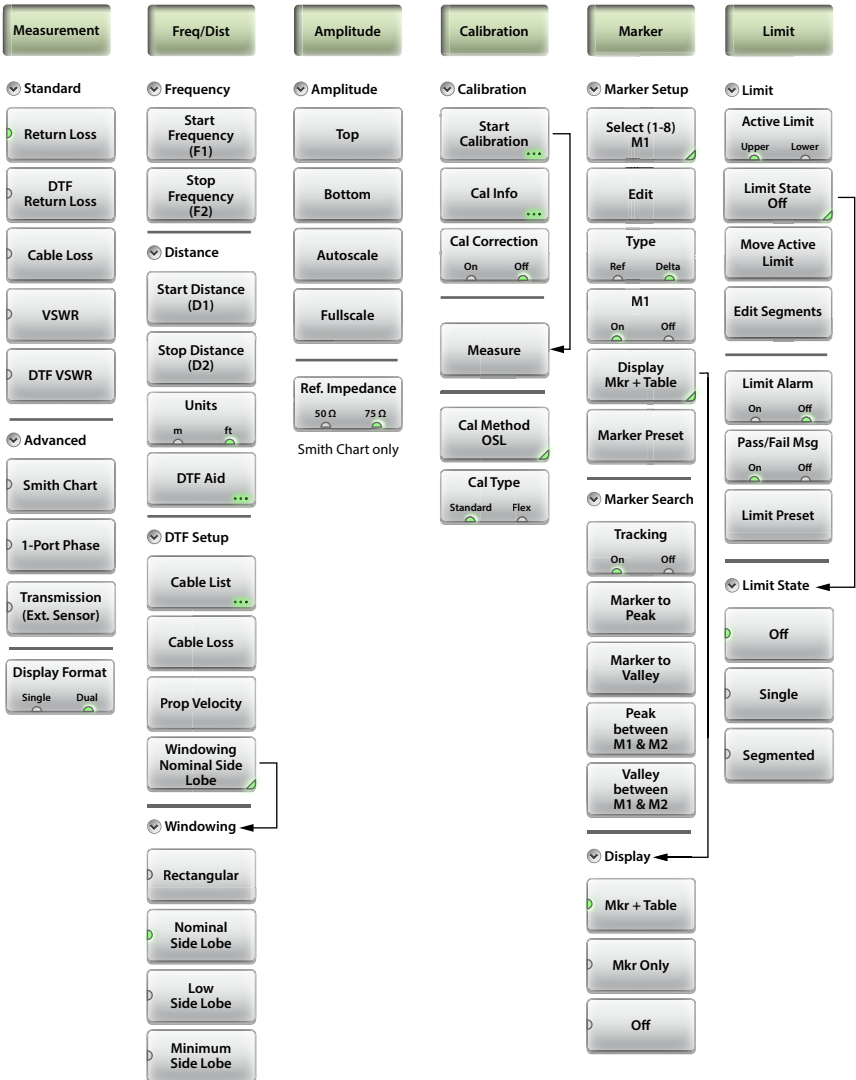on the display from top to bottom under each main menu.

Figure 3-38. Menu Keys (1 of 2)
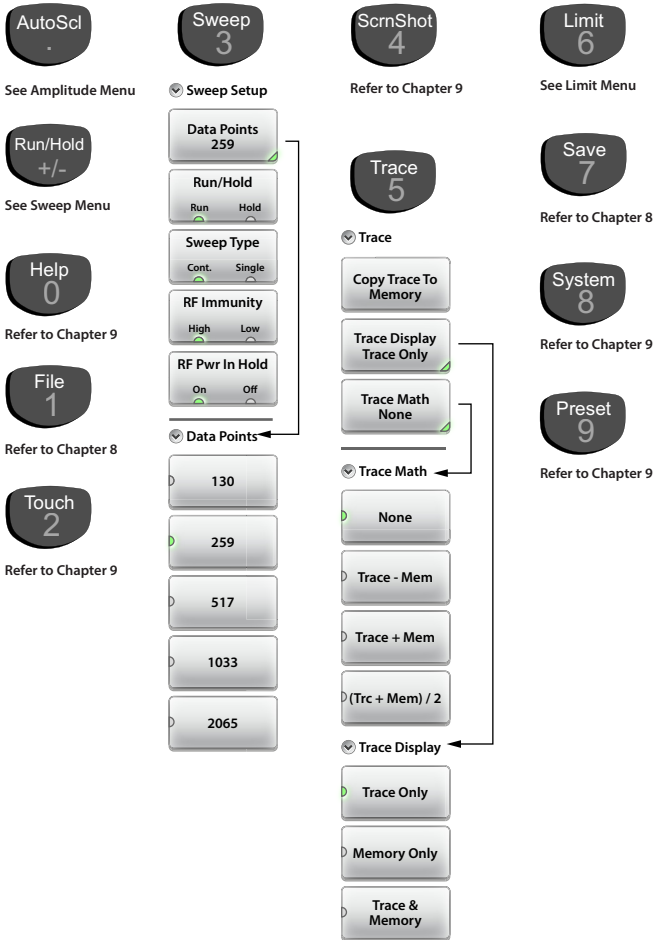
Figure 3-39. Main Menu Keys (2 of 2)

3-12   Measurement Menu

Key Sequence: **Measurement**
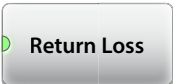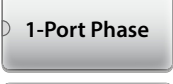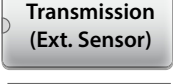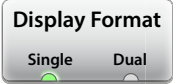
Measurement ◇ **Standard** ▷ **Return Loss** ▷ **DTF Return Loss** ▷ **Cable Loss** ▷ **VSWR** ▷ **DTF VSWR** ◇ **Advanced** ▷ **Smith Chart** ▷ **1-Port Phase** ▷ **Transmission (Ext. Sensor)** **Display Format** Single Dual	**Standard:** **Return Loss:** Return Loss is used to characterize RF components 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. **DTF Return Loss:** The DTF measurement displays return loss values versus distance. If the frequency measurements fail or indicate a problem in the system, then 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. **Cable Loss:** The cable loss test verifies the signal attenuation level of the cable. **VSWR:** Press the VSWR submenu key to view the impedance match in VSWR. VSWR is a ratio of voltage peaks to voltage valleys. **DTF VSWR:** Press this submenu key to display VSWR values versus distance. If the frequency measurements fail or indicate a problem in the system, then 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. **Advanced and Common:** Shown on next page.

Figure 3-40. Measurement Menu (1 of 2)

Measurement Menu (Continued)

Measurement

⌄ **Standard**

▷ **Return Loss**

▷ **DTF Return Loss**

▷ **Cable Loss**

▷ **VSWR**

▷ **DTF VSWR**

⌄ **Advanced**

▷ **Smith Chart**

▷ **1-Port Phase**

▷ **Transmission (Ext. Sensor)**

Display Format

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 Out/Reflect In 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 Out/Reflect In 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 Out/Reflect In port of the Site Master. The second port of the device connects to the External USB Sensor.

Common:

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 3-41. Measurement Menu (2 of 2)

3-13   Freq/Dist Menu

Key Sequence: **Freq/Dist**

Freq/Dist

⊘ **Frequency**

Start Frequency (F1)

Stop Frequency (F2)

⊘ **Distance**

Start Distance (D1)

Stop Distance (D2)

Units
m   ft

DTF Aid
...

Frequency:

Start Frequency (F1): Press the Start Frequency (F1) submenu key and enter the desired frequency using the **Up/Down** arrow keys, the rotary knob, or the keypad.   Press **Enter** to complete the entry or if entering a frequency using the keypad, press the appropriate units key.

Stop Frequency (F2): Press the Stop Frequency (F2) submenu key and enter the desired frequency using the **Up/Down** arrow keys, the rotary knob, or the keypad. Press **Enter** to complete the entry or if entering a frequency using the keypad, press the appropriate units key.

Distance:

Start Distance (D1): Press the Start Distance submenu key and enter the desired distance using the **Up/Down** arrow keys, the rotary knob, or the keypad. Press **Enter** to complete the entry or if entering a distance using the keypad, press the appropriate units key.

Stop Distance (D2): Press the Stop Distance submenu key and enter the desired distance using the **Up/Down** arrow keys, the rotary knob, or the keypad. Press **Enter** to complete the entry or if entering a distance using the keypad, press the appropriate units key.

Units: Press the Units key to toggle distance units between meters and feet.

DTF Aid: Opens the DTF Aid dialog box (Figure 3-10). This interactive parameter box allows setting multiple parameters and displays maximum testing distance and resolution.

Figure 3-42. Frequency/Distance Menu (1 of 2)

Freq/Dist Menu (Continued)

Key Sequence: **Freq/Dist**

◉ DTF Setup	**DTF Setup:**
Cable List •••	**Cable List:** The Cable List submenu key opens a list of available cable specifications (Figure 3-11). Using **Up/Down** arrow keys, the rotary knob, or the touchscreen, select the desired cable and press Enter.
Cable Loss	Note: 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.
Prop Velocity	**Cable Loss:** Press the Cable Loss submenu key and enter the loss in dB/ft or dB/m for the selected cable using the keypad, **Up/Down** arrow keys, or the rotary knob and press **Enter**.
Windowing Nominal Side Lobe	**Prop Velocity:** Press the Prop Velocity submenu key and enter the applicable propagation velocity for the selected cable using the keypad, **Up/Down** arrow keys, or the rotary knob and press **Enter**.
	Windowing: Opens the "Windowing Menu" on page 3-57.

Figure 3-43. Frequency/Distance Menu (2 of 2)

Windowing Menu

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

Freq/Dist	**Rectangular:** Rectangular Windowing shows the highest side lobe levels (worst) and the greatest main lobe resolution (best).
⊙ **Windowing** **Rectangular**	**Nominal Side Lobe:** Nominal Side Lobe Windowing shows less side lobe levels than Rectangular Windowing (good) but lower main lobe resolution (very good).
Nominal Side Lobe	**Low Side Lobe:** Low Side Lobe Windowing shows less side lobe levels than Nominal Windowing (very good) but lower main lobe resolution (good).
Low Side Lobe **Minimum Side Lobe**	**Minimum Side Lobe:** Minimum Side Lobe Windowing shows the lowest side lobe levels (best) but the least main lobe resolution (worst).

Figure 3-44. Windowing Menu

3-14   Amplitude Menu

Key Sequence: **Amplitude**

Amplitude	**Top:** Sets the top amplitude value using the keypad, the arrow keys, or the rotary knob. Press **Enter** to complete the entry.
⊙ **Amplitude** **Top**	**Bottom:** Sets the bottom amplitude value using the keypad, the arrow keys, or the rotary knob. Press **Enter** to complete the entry.
Bottom	**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.
Autoscale **Fullscale**	**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.
Ref. Impedance 50 Ω 75 Ω	The following submenu key appears only for Smith Chart measurements, and is then the only submenu key in the Amplitude Menu: **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 3-46 illustrates a Smith Chart measurement, shown in dual display format.

Figure 3-45. Amplitude Menu
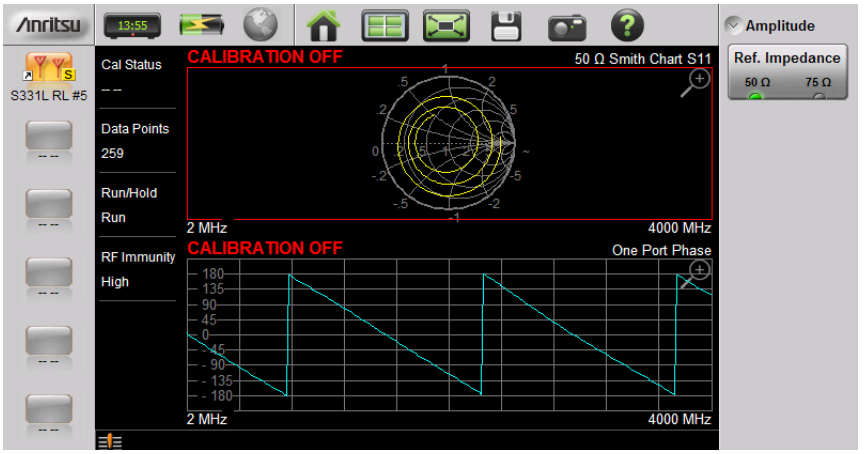
Figure 3-46. Set Reference Impedance for Smith Chart Measurement

3-15   Calibration Menu

Key Sequence: **Calibration**
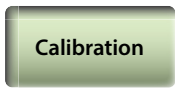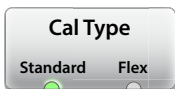
Calibration	**Start Calibration:** Opens the Calibration dialog box. Refer to Chapter 7, "Calibration" for detailed information.
⊙ **Calibration**	**Cal Info:** Displays the Calibration Information table showing the current and active calibration settings.
Start Calibration ...	**Cal Correction:** Turn Cal Correction On to apply the correction factor to the current measurement.
Cal Info ...	**Measure:** Starts the calibrations process. Follow the on screen instructions.
Cal Correction On Off	**Cal Method:** Selects one of the available calibration methods: OSL, InstaCal, Transmission (Ext. Sensor), or OSL + Transmission (Ext. Sensor).
Measure	**Cal Type:** Toggles between Standard (fixed frequency range) calibration and Flex (full frequency range) calibration.
Cal Method OSL	
Cal Type Standard Flex	

Figure 3-47. Calibration Menu

3-16   Marker Menu

Key Sequence: **Marker**

Marker
 	
◉ **Marker Setup**
 	
Select (1-8) M1
 	
Edit
 	
Type
Ref   Delta
 	
M1
On   Off
 	
Display Mkr + Table
 	
Marker Preset
	Marker Setup:
	
	Select (1-8) M#: Press to turn on a marker (1 to 8) and selects which marker is active (green half circle). Current active marker is displayed on the button (M1).
	
	Edit: Press to change the position of the active marker using the **Up/Down** arrow keys, rotary knob or the keypad.
	
	Type: Sets the current active marker as a reference (standard) marker or a delta marker to Marker 1. Marker 1 is always a reference marker.
	
	M# (On Off): Toggles the display of the active marker on or off. When off the location of the marker is stored.
	
	Display (Mkr + Table, Mkr Only, Off): Press to open display options.
	
	    Mkr+Table: Displays both the markers that are on and marker table.
	
	    Mkr Only: Displays markers that are on, hides the marker table.
	
	    Off: Hides all markers and the marker table.
	
	Marker Preset: Turns off all markers except for Marker 1. Sets Marker 1 location to the middle of the sweep.

Figure 3-48. Marker Menu (1 of 2)

Marker Menu (Continued)

Key Sequence: **Marker**

☑ **Marker Search**

Tracking

On   **Off**

Marker to Peak

Marker to Valley

Peak between M1 & M2

Valley between M1 & M2

Marker Search:

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.

Marker to Peak: Places the currently active marker on the highest signal amplitude currently displayed on screen.

Marker to Valley: Places the currently active marker on the lowest signal amplitude currently displayed on screen.

Markers 5, 6, 7, and 8 can perform a special Marker search to find the Peak or Valley between two other markers.

When Marker 5 or Marker 7 is Active:

Peak Between M1 & M2: Places Marker 5 or 7 on the highest signal amplitude between Marker 1 and Marker 2.

Valley Between M1 & M2: Places Marker 5 or 7 on the lowest signal amplitude between Marker 1 and Marker 2.

When Marker 6 or Marker 8 is Active:

Peak Between M3 & M4: Places Marker 6 or 8 on the highest signal amplitude between Marker 3 and Marker 4.

Valley Between M3 & M4: Places Marker 6 or 8 on the lowest signal amplitude between Marker 3 and Marker 4.

Figure 3-49. Marker Menu (2 of 2)

3-17   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. Limit alarm failures are reported whenever a signal crosses the limit line.

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

	Limit
Limit	**Active Limit (Upper Lower):** This key toggles the active limit line settings to the Upper or Lower limit.
⌄ **Limit**	**Limit State (Off Single Segmented):** This key sets the limit line state to Off, Single, or Segmented. See Figure 3-51, "Limit Line State Menu" on page 3-64. Limit line amplitude is stored even when turned off.
Active Limit Upper Lower	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.
Limit State Off	**Move Active Limit:** Press this key to change the amplitude of the limit line with the **Up/Down Arrow** keys, rotary knob, or the numeric keypad. If the limit line is divided into segments, then all segments move by the same amount.
Move Active Limit	
Edit Segments	**Edit Segments:** Press this key to display the Segments menu and a table of limit line segments. Tap a segment (Upper or Lower), and then choose a function from Figure 3-52, "Limit Line Segments Menu" on page 3-64.
Limit Alarm On Off	**Limit Alarm (On Off):** When turned On, the Limit Alarm sounds a repeating beep when the trace touches the limit line.
Pass/Fail Msg On Off	**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).
Limit Preset	**Limit Preset:** Turns the limit line off and clears amplitude information. The next time that a limit line is turned on, it will be displayed at the default location (center of the display).

Figure 3-50.   Limit Menu

Limit Menu (Continued)

Key Sequence: **Limit** > Limit State

⊘ **Limit State** **Off** **Single** **Segmented**	*Limit State* **Off:** The limit line state is set to off. **Single:** The limit line state is set to on and the limit line type is set to single. **Segmented:** The limit line state is set to on and the limit line type is set to segmented.
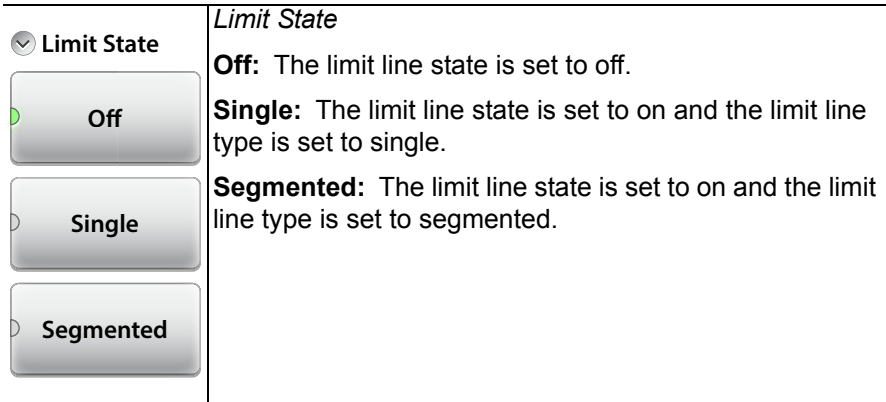
Figure 3-51. Limit Line State Menu

Key Sequence: **Limit** > Edit Segments

⊘ **Segments** **Add** **Edit** **Delete** **Close (ESC)**	*Edit Segments* **Add:** Press this key to add a segment. A dialog box is displayed allowing selection of Upper or Lower limit lines and settings for Start and Stop x-axis values and y-axis values. Press Enter to save changes, or press ESC to close without saving. **Edit:** Press this key to edit the highlighted segment. A dialog box is displayed allowing selection of Upper or Lower limit lines and settings for Start and Stop x-axis values and y-axis values. Press Enter to save changes, or press ESC to close without saving. **Delete:** Press this key to delete the selected limit segments. **Close (ESC):** Press this key to close the Segments menu and return to the Limit menu.

Figure 3-52. Limit Line Segments Menu

3-18   Sweep Menu

Key Sequence: **Sweep** (3)
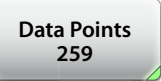
Sweep 3 ▽ **Sweep Setup** **Data Points** **259** **Run/Hold** **Run** **Hold** **Sweep Type** **Cont.** **Single** **RF Immunity** **High** **Low** **RF Pwr In Hold** **On** **Off**	**Data Points:** Sets the number of data points: 130, 259, 517, 1033 or 2065. **Run/Hold:** Toggles between Run and Hold. 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. **Sweep Type:** This toggles the sweep between single sweep and continuous sweep. In single sweep mode, each sweep must be activated by the Run/Hold key. **RF Immunity, High / Low:** The instrument defaults to RF Immunity High and is the suggested setting. See "RF Immunity" on page 3-31 for details. **RF Pwr In Hold:** Sets the RF Output power to be turned off when Run/Hold is toggled to Hold. See "RF Pwr In Hold" on page 3-31 for details.

Figure 3-53. Sweep Menu

3-19   Trace Menu

Key Sequence: **Trace** (5)

Trace:

Copy Trace to Display Memory: Copies the current trace display to memory for use in Trace Math and Trace Display options.

Trace Display: Press to change the display options.

> **Trace Only:** The active trace is shown (yellow).

> **Memory Only:** The trace stored in memory is displayed in purple.

> **Trace & Memory:** Displays both the stored trace (purple) if a trace is stored in memory and the current active trace (yellow).

Trace Math: Press to change the trace math options.

> **None:** The active trace is shown as is with no math functions.

> **Trace – Mem:** Displays the difference between the active trace and the trace in memory.

> **Trace + Mem:** Displays the results of logarithmic adding of the active trace and the trace in memory.

> **(Trc + Mem) / 2:** Displays the results of the average of the active trace and trace in memory.

Figure 3-54. Trace Menu

3-20   Other Menus Keys

Refer to Table 2-1, "Site Master Keypad Functions" on page 2-10.

Chapter 4 — Classic Mode Operation

4-1 Introduction

The Site Master S331L 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 S331L 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 S331L screen display in Classic mode versus Advanced mode.

Note	Use the **Menu** key and confirm that the instrument is in Classic Cable & Antenna Analyzer mode before continuing.
	Classic Mode will always be displayed above the measurement type when the instrument is in Classic mode.

Many functions of the Site Master S331L are common between the Classic and Advanced measurement modes. Refer to Chapter 3, "Cable and Antenna Measurements" for a complete overview of the instrument GUI.

The Marker menu and the Limit menu in Classic mode are described on page 4-6 and on page 4-8.
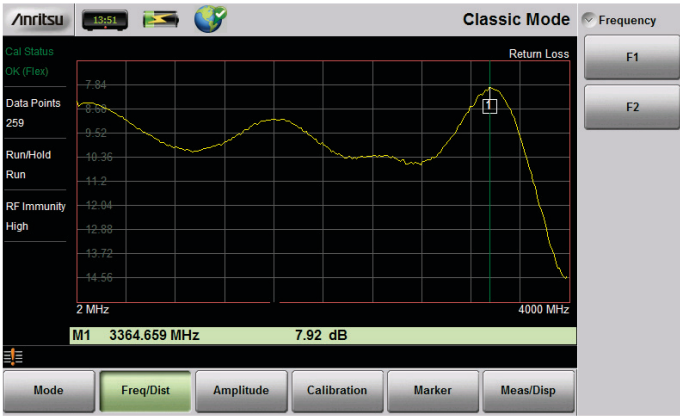
"Classic" Mode (Chapter 4)
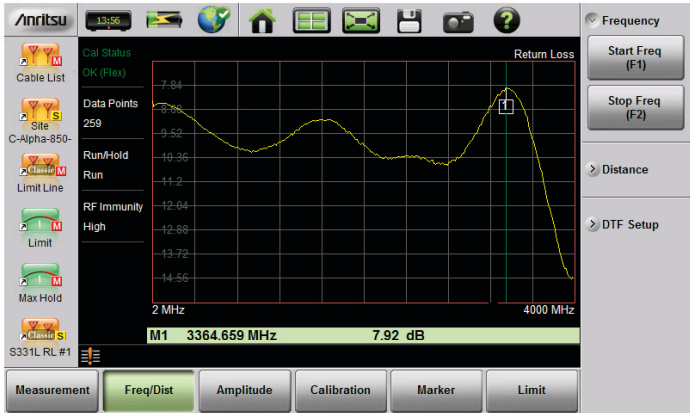
"Advanced" Mode (Chapter 3)

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 3-40 through Figure 3-54.

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

Classic Mode	Advanced S331L Cable and Antenna Mode
Mode Menu	"Measurement Menu" on page 3-53
Freq - SWR	"VSWR" on page 3-53
Freq - Return Loss	"Return Loss" on page 3-53
Freq - Cable Loss (one port)	"Cable Loss" on page 3-53
DTF - SWR	"DTF VSWR" on page 3-53
DTF - Return Loss	"DTF Return Loss" on page 3-53
—	"Smith Chart" on page 3-54
—	"1-Port Phase" on page 3-54
Freq/Dist Menu	"Freq/Dist Menu" on page 3-55
F1	"Start Frequency (F1)" on page 3-55
F2	"Stop Frequency (F2)" on page 3-55
D1	"Start Distance (D1)" on page 3-55
D2	"Stop Distance (D2)" on page 3-55
More	"DTF Setup" on page 3-56
Meas/Disp Menu	Refer to "Sweep Menu" on page 3-65 and "Trace Menu" on page 3-66
Marker Menu	
"Marker Menu" on page 4-6	"Marker Menu" on page 3-61
Limit Menu	
"Limit Menu" on page 4-8	"Limit Menu" on page 3-63

Note	Also refer to Chapter 3 for descriptions of other menus not specifically mentioned in Table 4-1.

Figure 4-2 and Figure 4-3 show an overview of the Classic Cable and Antenna Analyzer menus.

| Mode | Freq/Dist | Amplitude | Calibration | Marker | Meas/Disp |

Mode
- Freq - SWR
- Freq - Return Loss
- Freq - Cable Loss (one port)
- DTF - SWR
- DTF - Return Loss

Freq/Dist
- Frequency
  - F1
  - F2
- Distance
  - D1
  - D2
  - Units (m / ft)
  - DTF Aid ...
  - More
- DTF Setup
  - Cable List ...
  - Cable Loss
  - Prop Velocity
  - Windowing Nominal Side Lobe
  - Back

Amplitude
- Top
- Bottom
- Autoscale
- Fullscale

Calibration
- Start Calibration ...
- Cal Info ...
- Cal Correction (On / Off)
- Measure
- Cal Method (OSL / InstaCal)
- Cal Type (Standard / Flex)

Marker
- M1
- M2 (OFF)
- M3 (OFF)
- M4 (OFF)
- M5 (OFF)
- M6 (OFF)
- All Mkr Off

Marker x
- M x (On / Off)
- Edit
- Type (Ref / Delta) — Markers 2-4
- Marker to Peak — Markers 1-4
- Marker to Valley — Markers 1-4
- Peak Between M1 & M2 — Marker 5
- Valley Between M1 & M2 — Marker 5
- Peak Between M3 & M4 — Marker 6
- Valley Between M3 & M4 — Marker 6
- Back

Meas/Disp
- Data Points 259
- Run/Hold (Run / Hold)
- Sweep Type (Cont. / Single)
- RF Immunity (High / Low)
- RF Pwr In Hold (On / Off)
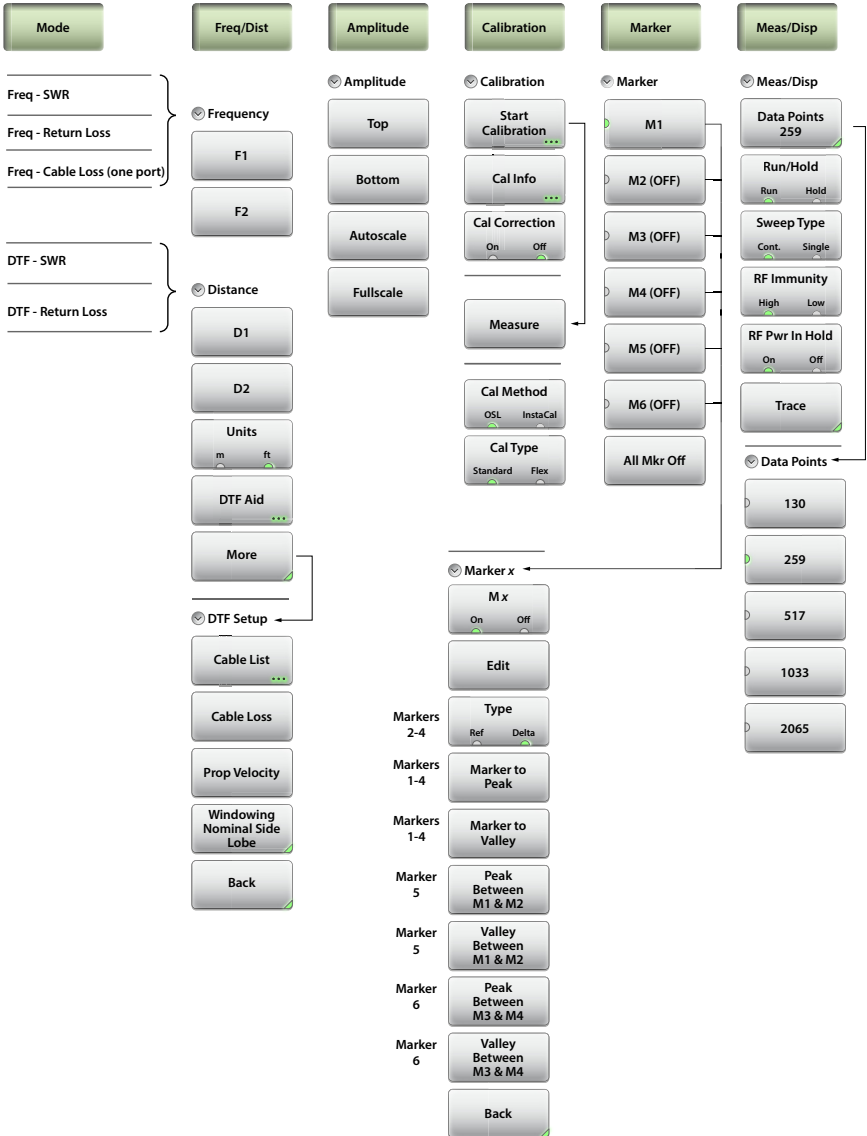- Trace
- Data Points
  - 130
  - 259
  - 517
  - 1033
  - 2065

Figure 4-2.   Classic Mode Menu Keys (1 of 2)

AutoScl
.

See Amplitude Menu

Run/Hold
+/-

See Meas/Disp Menu

Help
0

Refer to Chapter 9

File
1

Refer to Chapter 8

Touch
2

Refer to Chapter 9

Sweep
3

Meas/Disp

| Data Points 259 |
| Run/Hold |
| Run   Hold |
| Sweep Type |
| Cont.   Single |
| RF Immunity |
| High   Low |
| RF Pwr In Hold |
| On   Off |
| Trace |

Data Points

| 130 |
| 259 |
| 517 |
| 1033 |
| 2065 |

ScrnShot
4

Refer to Chapter 9

Trace
5

Trace

| Copy Trace To Memory |
| Trace Display Trace Only |
| Trace Math None |

Trace Math

| None |
| Trace - Mem |
| Trace + Mem |
| (Trc + Mem) / 2 |

Trace Display

| Trace Only |
| Memory Only |
| Trace & Memory |

Limit
6

Single Limit

| Limit Line |
| On   Off |
| Edit Value |

| Limit Alarm |
| On   Off |
| Pass/Fail Msg |
| On   Off |
| Limit Preset |

Save
7

Refer to Chapter 8

System
8

Refer to Chapter 9

Preset
9

Refer to Chapter 9

Figure 4-3.   Classic Mode Menu Keys (2 of 2)

4-2 Marker Menu

Key Sequence: **Marker**

	Marker
Marker ◔ Marker ▷ **M1**	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.
	M1: Press to display the Marker 1 menu (Figure 4-5 on page 4-7), which gives access to marker parameter settings.
▷ M2 (OFF)	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 also indicates that the marker is ON.
▷ M3 (OFF)	Submenu keys M2 through M6 behave in the same manner as M1.
▷ M4 (OFF)	
▷ M5 (OFF)	
▷ M6 (OFF)	
All Mkr Off	**All Mkr Off:** Press this key to turn OFF all markers.

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

Marker Menu (Continued)

Key Sequence: **Marker** > M 1
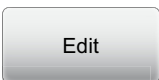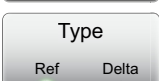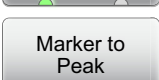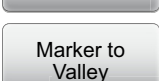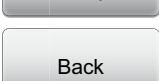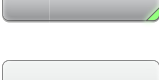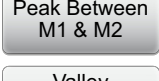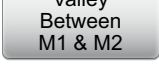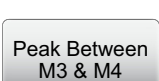
		Marker
⊙ Marker 1		
	M 1 On Off	**M 1 (On Off):** Press this key to turn OFF the selected marker (M1 to M6).
	Edit	**Edit:** Press this key to enter a marker value.
	Type Ref Delta	**Type (Ref Delta):** Press this key to toggle the marker type between Reference and Delta. This key is displayed for markers M2 through M4 only. Marker M1 is a Reference marker only.
Markers 1-4	Marker to Peak	**Marker to Peak:** Press this key to set a Marker (M1 to M4 only) on the highest signal amplitude in the displayed trace.
Markers 1-4	Marker to Valley	**Marker to Valley:** Press this key to set a Marker (M1 to M4 only) on the lowest signal amplitude in the displayed trace.
	Back	**Back:** Press this key to return to the Marker menu.
Marker 5	Peak Between M1 & M2	***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:*** **Peak Between M1 & M2:** Places Marker 5 on the highest signal amplitude between Marker 1 and Marker 2.
Marker 5	Valley Between M1 & M2	**Valley Between M1 & M2:** Places Marker 5 on the lowest signal amplitude between Marker 1 and Marker 2.
Marker 6	Peak Between M3 & M4	***When Marker 6 is Active:*** **Peak Between M3 & M4:** Places Marker 6 on the highest signal amplitude between Marker 3 and Marker 4.
Marker 6	Valley Between M3 & M4	**Valley Between M3 & M4:** Places Marker 6 on the lowest signal amplitude between Marker 3 and Marker 4.

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. Limit alarm failures are reported whenever a signal crosses the limit line.

Key Sequence: **Limit** (6)

Limit 6 ⌄ **Single Limit** **Limit Line** On Off **Edit Value** **Limit Alarm** On Off **Pass/Fail Msg** On Off **Limit Preset**	*Single Limit* **Limit Line:** This key toggles the limit line on or off. Limit line amplitude is stored even when turned off. **Edit Value:** Press this key to change the amplitude of the limit line with the **Up/Down** arrow keys, rotary knob, or the numeric keypad. **Limit Alarm (On Off):** When turned On, the Limit Alarm will sound a beep when the trace touches the limit line. **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). Refer to . **Limit Preset:** Turns the limit line Off and clears amplitude information. The next time that a limit line is turned On, it will be displayed at the default location (center of the display).

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 — Internal Power Meter

5-1   Overview

This chapter provides an overview of power meter measurements and how to setup the instrument to use the power meter. The power meter displays measured input power at the power meter connector in dBm and Watts or relative power in dB and percentage. No external sensor is required or used. The Power Meter frequency span is fixed to receive RF frequencies from 50 MHz to 4 GHz.

Note	Check the graph title in the top right of the display to confirm that the instrument is in Power Meter mode. If necessary, press the **Menu** key to change modes.

5-2   Introduction

Figure 5-1 illustrates the preset Power Meter display with limits turned on and no source power.

Figure 5-1.   Power Meter Display Overview
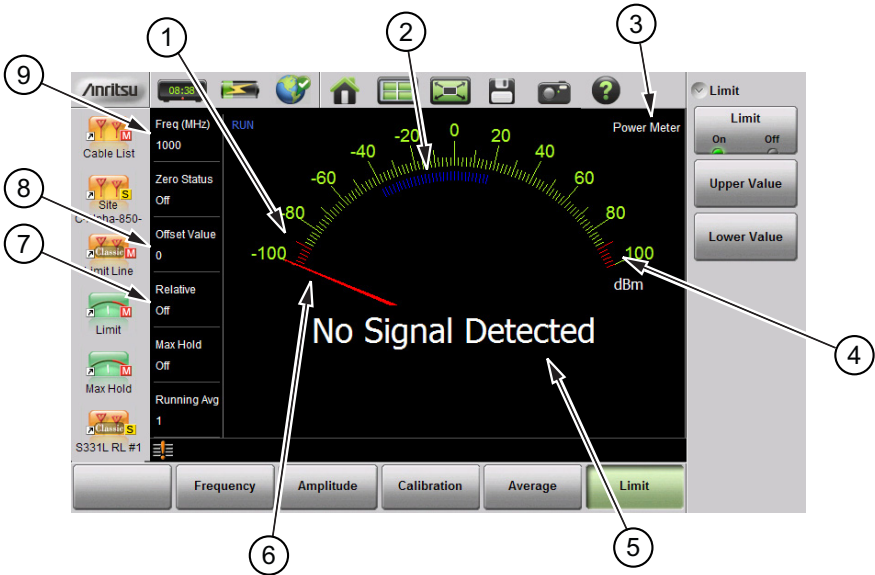
1	Preset -90 dBm Lower Limit
2	Blue Ticks Indicate Approximate Power Meter Range
3	Power Meter Mode
4	Preset 90 dBm Upper Limit
5	Current Power in dBm and Watts (including any Offset Value) or "No Signal Detected" if the Current Power Level is Below the Power Meter Range
6	Power Meter Needle (No Source Power)
7	Relative Power (db and %) or Absolute Power (dBm and Watts)
8	Offset Value to Account for External Attenuation or Gain
9	Source Frequency Used for Correction Factor

5-3   General Measurement Setup

Warning	Maximum power level to the Site Master S331L Power Meter connector without causing damage is 27 dBm.

Connection and Offset

1. Connect the source to be measured to the power meter connector. Use any required external attenuation or gain so the expected power level is between -33 dBm and +20 dBm.

2. Press **Amplitude** then Offset Value. Enter an offset value for any external attenuation (negative value) or external gain (positive value). The displayed power will be adjusted by the offset value.

   As an example, a power source around 1 Watt (30 dBm) would cause damage to the Site Master and is beyond the measurement range. 10 dB of in-line external attenuation will bring the power level down to approximately 100 mW, within the power meter measurement range. In power meter mode, adding a Offset Value of -10 dB will remove the external attenuation from the displayed power level.

Set the Measurement Frequency

Press the **Frequency** main menu key then press Measurement Frequency. Set the frequency of source using the numeric keypad then select the unit of measure button. Failure to set the frequency will cause inaccurate measurements.

Setting the Amplitude

The maximum and minimum values of the analog display can be set in the **Amplitude** menu. Relative Power is a useful feature to obtain the power reading with respect to a previous power level.

1. Press the **Amplitude** main menu key.

2. Press the Max Value submenu key and set the upper scale value. Press the Min Value submenu key and set the lower scale value.

   or

Press the Autoscale submenu key to adjust the range automatically. The current power level will be centered with Min Value automatically set at 90% of the current power and Max Value automatically set at 110% of the current power. Refer to Figure 5-2.

Before Autoscale
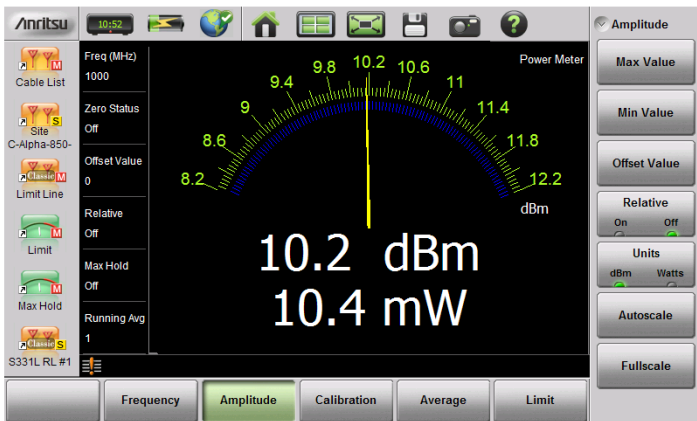
After Autoscale

Figure 5-2.   Autoscale to Zoom In on a Measurement

Changing the Display Units

The power meter scale can be displayed in dBm or Watts. Use the following procedure to change the displayed units:

   1. Press the **Amplitude** main menu key.

   2. Press the Units submenu key and select the display units.

Displaying Relative Power

Use the following procedure to select Relative Power through the Amplitude menu.

   1. With the desired base power (reference) level connected to the input of your instrument, press the **Amplitude** main menu key.

   2. Press the Relative submenu key. Note that the absolute value of the measurement at the time the Relative key is pressed is shown in yellow below the numerical display (Figure 5-3 on page 5-6).

   3. Any change in power will now be displayed relative to the set reference level. Refer to the bottom image in Figure 5-3 on page 5-6.

First Power Level in dBm and mW

Relative
Off →

9.71 dBm
9.3 mW

First Power Level, Relative On

Reduced Second Power Level, -6 dB (25%) of First
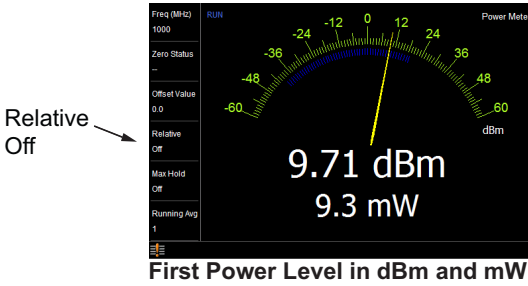
Figure 5-3.   Relative Power Example

Note	Relative power is displayed numerically in dB and percentage, scale is absolute.

Setting Upper and Lower Limits

Maximum and minimum limits can be set as follows:

1. Press the **Limit** main menu key and set Limit to On.

2. Press the Upper Value submenu key and use the keypad, **Up/Down** arrow keys, or the rotary knob to set the desired upper limit. Then press **Enter**.

3. Press the Lower Value submenu key and use the keypad, **Up/Down** arrow keys, or the rotary knob to set the desired upper limit. Then press **Enter**.

The needle color and color of the numeric power level displayed below the graph change based on the current limit settings:

• Yellow needle, White text: Limits are turned off.

• Green need and text: Limits are on and the current power level value is within limits.

• Red needle and text: Limits are on and the current power level is not within limits.

Refer to Figure 5-4 on page 5-8 for examples of each condition.
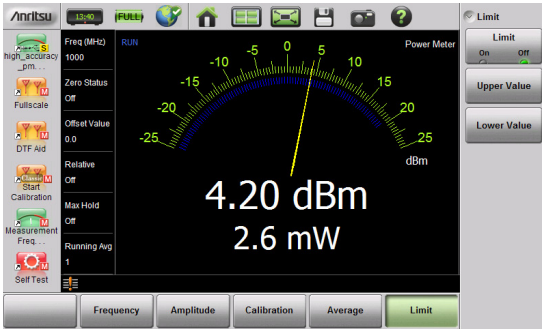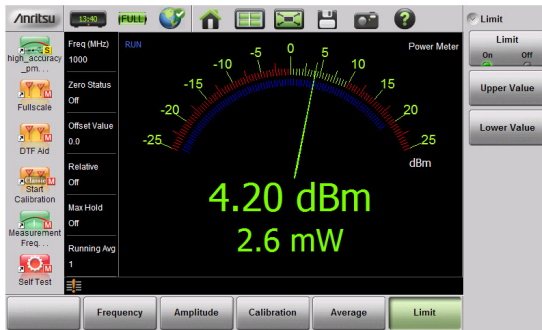
Limits Turned Off (Yellow Needle, White Text)

Power Level Within Limits (Green Text and Needle)
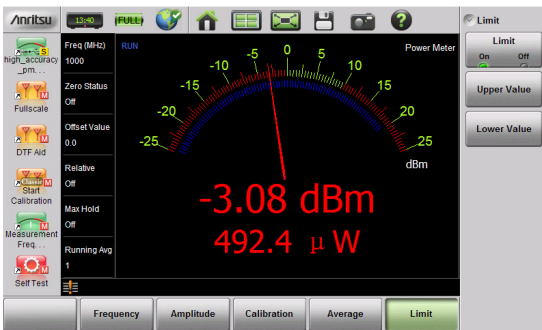
Power Level Beyond Limits (Red Text and Needle)

Figure 5-4.   Limit Setting Display Changes

Average Menu Options

If the displayed values are unstable increase the Running Average from the default value of 1. Maximum value is 60. Increasing the running average is useful when measuring unstable sources or when measuring near the zero calibration level described below.

To monitor and record the maximum power level over time, set Max Hold to On. The needle and numeric values will display the maximum recorded value until Max Hold is turned off.

In Cont + Run mode (Figure 5-4), the power meter is continuously measuring and updating the power reading. In Cont + Hold mode, the readings are halted.

In Single + Run mode, the power meter performs the number of readings set in Running Average (default is 1) and then places the instrument in Hold mode. Changing the mode from Hold to Run will initiate another series of readings and then returns the instrument mode to Hold once again.

Calibration

The Calibration Zero function can be used to remove unwanted low-level interference signals from the power measurement. The interference signals must be below –20 dBm for the zero function to execute. When measuring the Device Under Test with **Calibration** Zero On, the unwanted interference power level is subtracted from the power reading in linear terms (i.e., milliwatts) and displayed.

To perform a Zero calibration:

1. Connect the Device Under Test to the Site Master's InstaCal/Power Meter port.

2. Turn off the RF source of the Device Under Test, or disconnect the source from the test apparatus so only the noise/interference signals are present.

Note	If there is no interference signal detected by the instrument in Step 2, a "No Signal Detected" message appears on the screen and the Zero calibration is not necessary.

3. Press the **Calibration** main menu key and then set **Zero** to On.

4. Turn on the RF source of the Device Under Test or connect the source from the test apparatus. The power meter will now display the power level with the unwanted interference signal subtracted out.

Note	If there is excessive signal present at the port during the Zero Calibration (> –20 dBm), the following error message is displayed "Signal too high. Zeroing not allowed!"

Figure 5-5.   Zeroing Error Message

5-4   Power Meter Menus

Figure 5-6 shows the map of the Power Meter menus. The following sections describe main menus and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.
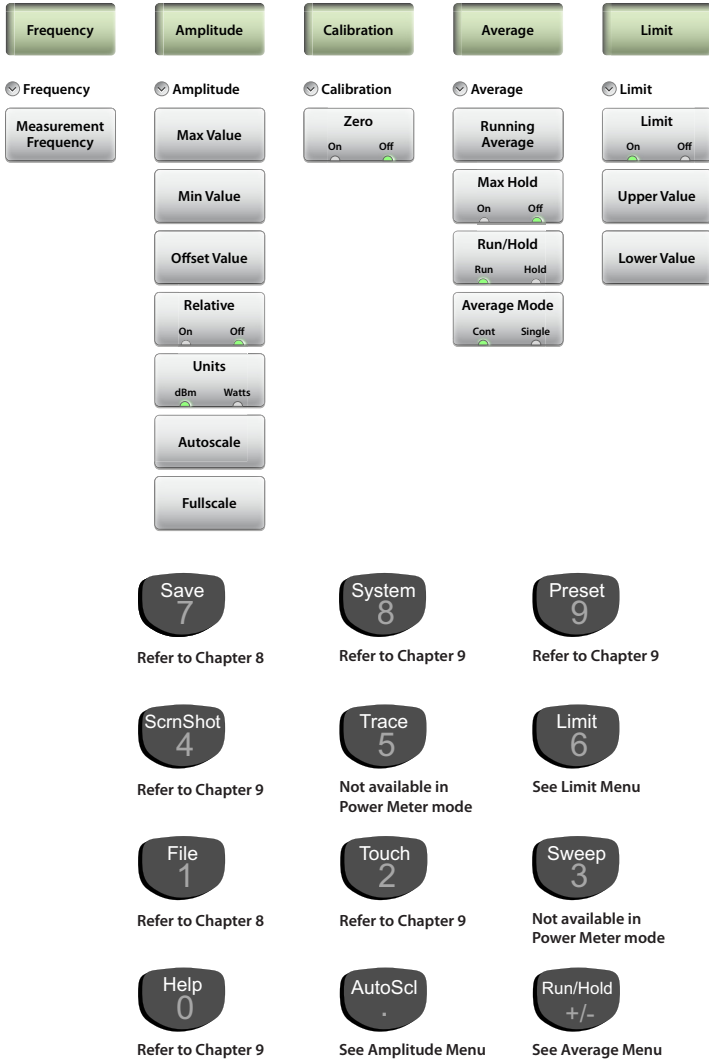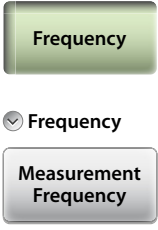

Figure 5-6.   Power Meter Menus

5-5   Frequency Menu

Key Sequence: **Frequency**

Frequency ⊙ **Frequency** **Measurement Frequency**	**Measurement Frequency:** Sets the frequency at the center of the measurement. Frequencies can be entered using the keypad and then selecting a unit (GHz, MHz, kHz, or Hz) submenu key or by using the rotary knob, or the **Up/Down** arrow keys and pressing **Enter** to set the frequency, or **Esc** to restore the previous setting.

Figure 5-7.   Power Meter Frequency Menu

5-6   Amplitude Menu

Key Sequence: **Amplitude**

Amplitude ⊙ **Amplitude** **Max Value** **Min Value** **Offset Value** **Relative** On Off **Units** dBm Watts **Autoscale** **Fullscale**	**Max Value:** Sets the maximum value on the display in dBm or Watts. **Min Value:** Sets the minimum value on the display in dBm or Watts. **Offset Value:** Used to set external power attenuation or gain. The displayed power level is offset by the dB value entered. **Relative On Off:** Press this submenu key to toggle relative power On or Off. This measurement shows the relative level of the current power level to the level when relative was turned on. When ON, the message **Relative On** shows in the message area. **Units dBm Watts:** Sets the unit of measure for the power meter. **Autoscale:** Adjusts the Top and Bottom values so that the power meter needle will be shown in the middle of the analog display. **Fullscale:** Adjusts the Top and Bottom values to their maximum allowed values (default settings).

Figure 5-8.   Power Meter Amplitude Menu

5-7   Calibration Menu

Key Sequence: **Calibration**
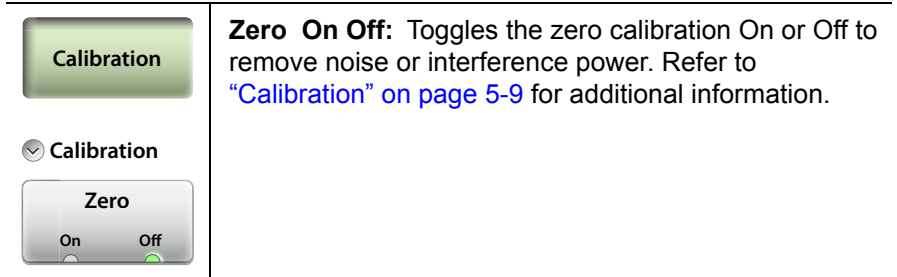
Calibration ⊙ Calibration **Zero** On Off	**Zero On Off:** Toggles the zero calibration On or Off to remove noise or interference power. Refer to "Calibration" on page 5-9 for additional information.

Figure 5-9.   Power Meter Calibration Menu

5-8   Average Menu

Key Sequence: **Average**
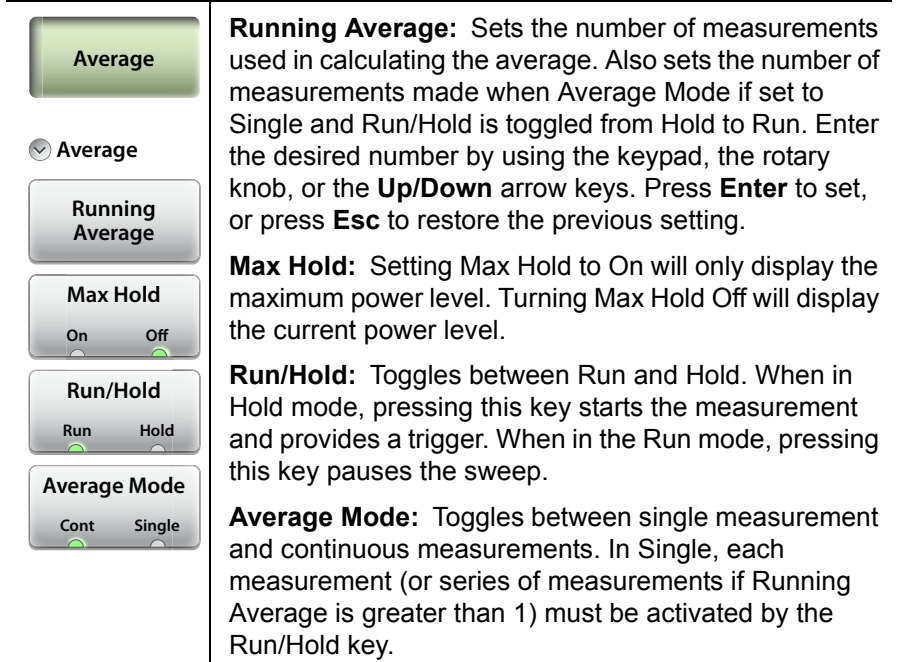
Average ⊙ Average **Running Average** **Max Hold** On Off **Run/Hold** Run Hold **Average Mode** Cont Single	**Running Average:** Sets the number of measurements used in calculating the average. Also sets the number of measurements made when Average Mode if set to Single and Run/Hold is toggled from Hold to Run. Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. Press **Enter** to set, or press **Esc** to restore the previous setting.
	Max Hold: Setting Max Hold to On will only display the maximum power level. Turning Max Hold Off will display the current power level.
	Run/Hold: Toggles between Run and Hold. When in Hold mode, pressing this key starts the measurement and provides a trigger. When in the Run mode, pressing this key pauses the sweep.
	Average Mode: Toggles between single measurement and continuous measurements. In Single, each measurement (or series of measurements if Running Average is greater than 1) must be activated by the Run/Hold key.

Figure 5-10. Power Meter Average Menu

5-9   Limit Menu

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

Limit 6 **or** **Limit** Limit **Limit** **On Off** **Upper Value** **Lower Value**	**Limit:** Turns the limits On or Off. **Upper Value:** Sets the upper limit (displayed as red hash marks). Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting. **Lower Value:** Sets the lower limit (displayed as red hash marks). Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting.

Figure 5-11.   Power Meter Limit Menu

5-10   Sweep Menu

This menu is not available in Power Meter measurement mode.

5-11   Trace Menu

This menu is not available in Power Meter measurement mode.

5-12   Other Menus Keys

Refer to Table 2-1, "Site Master Keypad Functions" on page 2-10.

Chapter 6 — High Accuracy Power Meter

6-1   Overview

This chapter provides an overview of power meter measurements and how to setup the instrument to use an external USB Sensor in the High Accuracy Power Meter mode. Actual power is measured at the USB sensor connector in dBm and Watts or relative power in dB and percentage. The frequency span and dynamic range for measurements is determined by the USB external sensor.

Note	Check the graph title in the top right of the display to confirm that the instrument is in High Accuracy Power Meter mode. If necessary, press the **Menu** key to change modes.

In this mode and with an appropriate sensor, the instrument can be used to make high accuracy power measurements including true RMS measurements for both CW and complex digitally modulated signals.

A general overview of USB sensors including connection and measurements setup begins on page 6-2.

With the MA24105A in-line sensor, additional functions are available including: forward and reverse measurements.

- Forward Measurements: Average Power, Crest Factor, Burst Average Power, Peak Envelope Power (PEP), and CCDF.
- Reverse Measurements: Average Power, Reflection Coefficient, Return Loss, and VSWR.

Refer to "MA24105A Inline Power Sensor" on page 6-12 for information specific to this in-line sensor.

Note	Sensors are not included with the Site Master and must be purchased separately. The S331L Site Master data sheet lists compatible sensors.

6-2   Introduction

Figure 6-1 illustrates the preset Power Meter display with limits turned on and no source power.
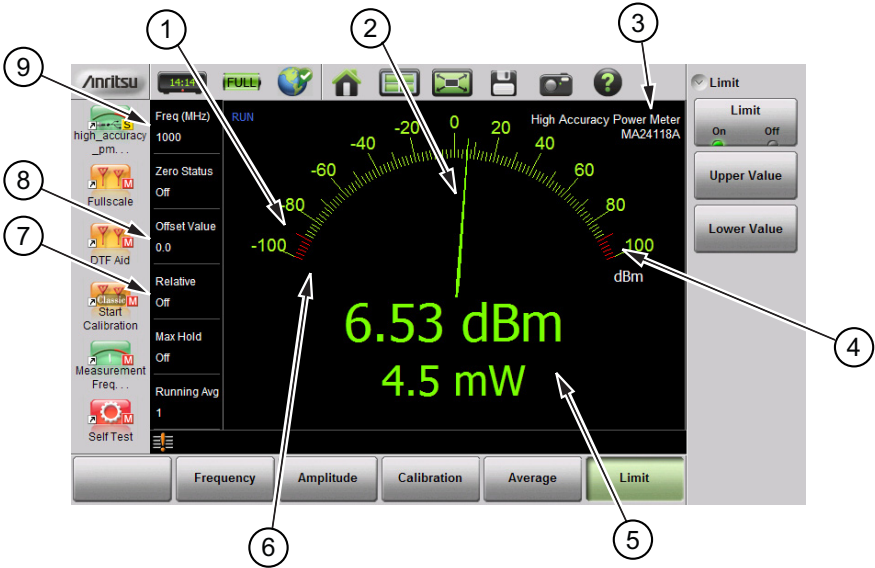
1	Preset -90 dBm Lower Limit
2	Power Meter Needle
3	High Accuracy Power Meter Mode and Connected USB Sensor
4	Preset 90 dBm Upper Limit
5	Current Power in dBm and Watts (including any Offset Value) or "No USB sensor detected" if an external USB sensor is not connected or recognized by the Site Master.
7	Relative Power (db and %) or Absolute Power (dBm and Watts)
8	Offset Value to Account for External Attenuation or Gain
9	Source Frequency Used for Correction Factor

Figure 6-1.   Power Meter Display Overview

6-3   General Measurement Setup

Note	Refer to the label on the USB sensor for information on frequency range and dynamic range.

Connection

Connection Setup for PSN50, MA24106A/08/18A/26A

S331L Site Master

Connection Setup for MA24105A

S331L Site Master
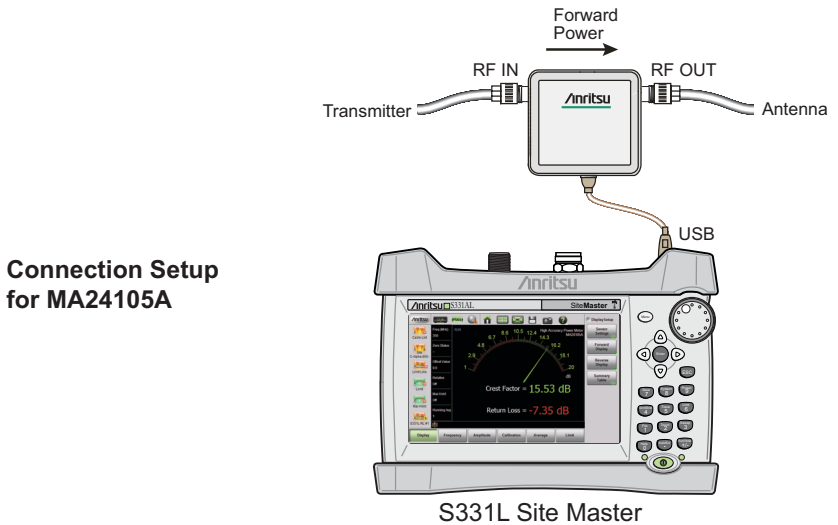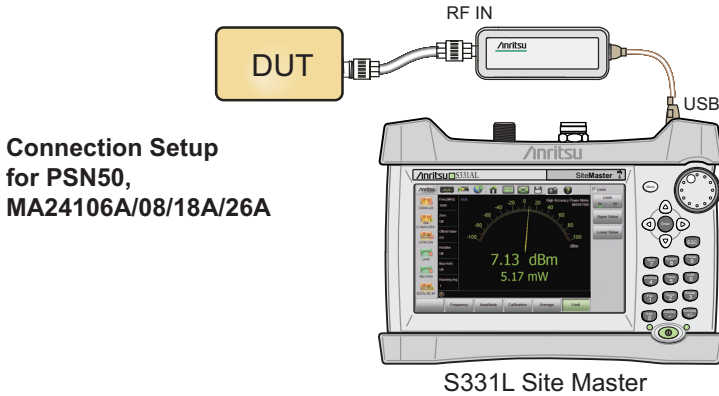
Figure 6-2.   External USB Sensor Connection Setups

Connection and Offset

1. Connect the source to be measured to the USB sensor. Use any required external attenuation or gain so the expected power level is within specification for the sensor.

2. Press **Amplitude** then Offset Value. Enter an offset value for any external attenuation (negative value) or external gain (positive value). The displayed power will be adjusted by the offset value.

As an example, a power source around 1 Watt (30 dBm) may cause damage to some sensors. 10 dB of in-line external attenuation will bring the power level down to approximately 100 mW, within the sensor's range. Adding a Offset Value of -10 dB will remove the external attenuation from the displayed power level.

Set the Measurement Frequency

Press the **Frequency** main menu key then press Measurement Frequency. Set the frequency of source using the numeric keypad then select the unit of measure button. Failure to set the frequency will cause inaccurate measurements.
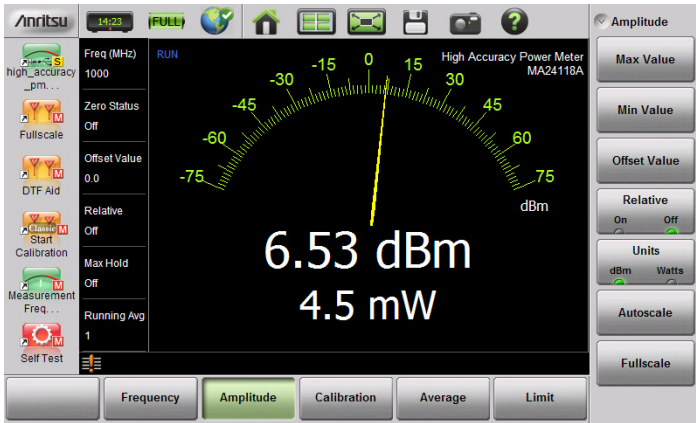
Setting the Amplitude

The maximum and minimum values of the analog display can be set in the **Amplitude** menu. Relative Power is a useful feature to obtain the power reading with respect to a previous power level.

1. Press the **Amplitude** main menu key.

2. Press the Max Value submenu key and set the upper scale value. Press the Min Value submenu key and set the lower scale value.

or

Press the Autoscale submenu key to adjust the range automatically. The current power level will be centered with Min Value automatically set at 90% of the current power and Max Value automatically set at 110% of the current power. Refer to Figure 6-3 on page 6-5.

Before Autoscale
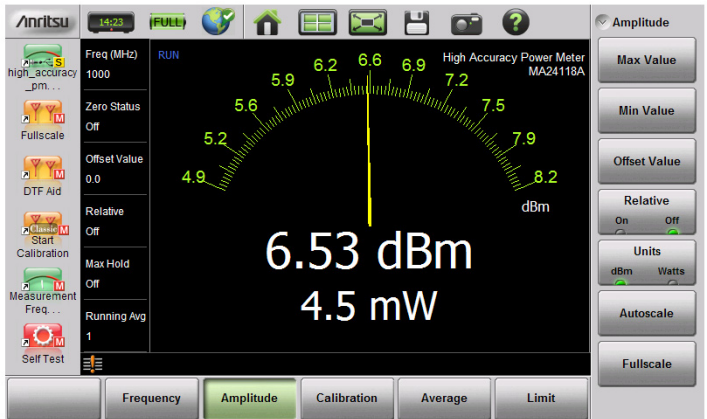
After Autoscale

Figure 6-3.   Autoscale to Zoom In on a Measurement

Changing the Display Units

The power meter scale can be displayed in dBm or Watts. Use the following procedure to change the displayed units:

   1. Press the **Amplitude** main menu key.

   2. Press the Units submenu key and select the display units.

Displaying Relative Power

Use the following procedure to select Relative Power through the Amplitude menu.

   1. With the desired base power (reference) level connected to the USB sensor, press the **Amplitude** main menu key.

   2. Press the Relative submenu key. Note that the absolute value of the measurement at the time the Relative key is pressed is shown in yellow below the numerical display (see Figure 6-4 on page 6-7).

   3. Any change in power will now be displayed relative to the set reference level. Refer to the bottom image in Figure 6-4 on page 6-7.

First Power Level in dBm and mW

First Power Level, Relative On
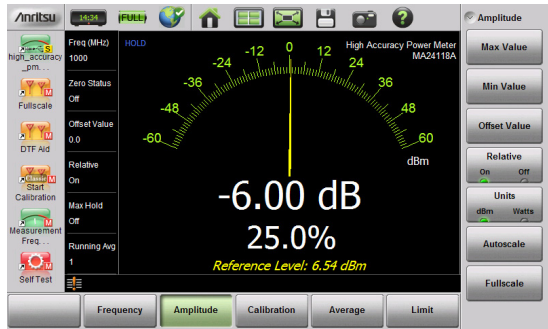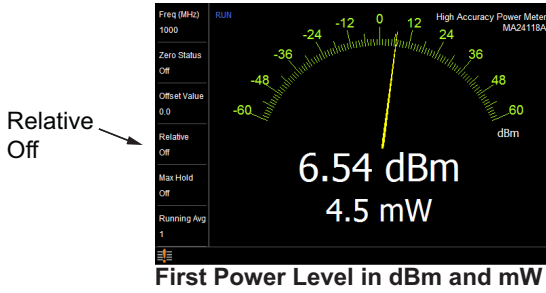

Reduced Second Power Level, -6 dB (25%) of First

Figure 6-4.   Relative Power Example

Note	Relative power is displayed numerically in dB and percentage, scale is absolute.

Setting Upper and Lower Limits

Maximum and minimum limits can be set as follows:

1. Press the **Limit** main menu key and set Limit to On.

2. Press the Upper Value submenu key and use the keypad, **Up/Down** arrow keys, or the rotary knob to set the desired upper limit. Then press **Enter**.

3. Press the Lower Value submenu key and use the keypad, **Up/Down** arrow keys, or the rotary knob to set the desired upper limit. Then press **Enter**.

The needle color and color of the numeric power level displayed below the graph change based on the current limit settings:

• Yellow needle, White text: Limits are turned off.

• Green need and text: Limits are on and the current power level is within limits.

• Red needle and text: Limits are on and the current power level is not within limits.

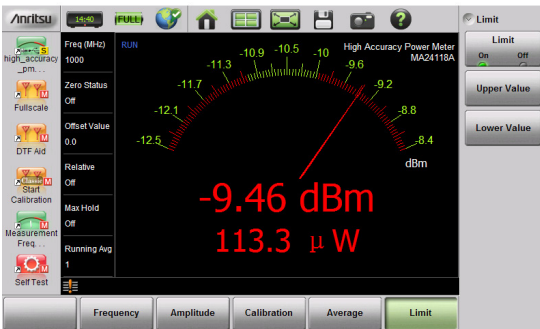Refer to for examples of each condition.
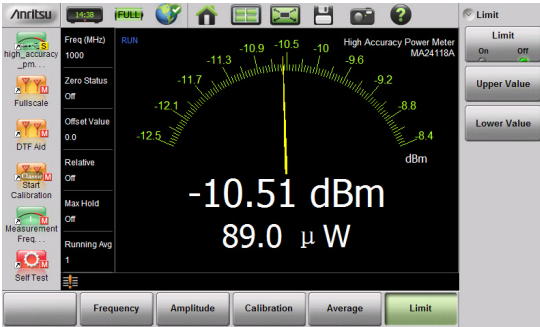
Limits Turned Off (Yellow Needle, White Text)
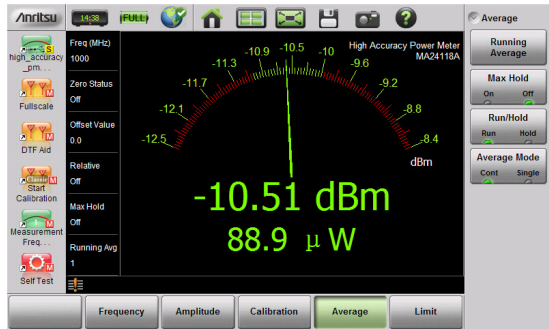
Power Level Within Limits (Green Text and Needle)

Power Level Beyond Limits (Red Text and Needle)

Figure 6-5.   Limit Setting Display Changes

Average Menu Options

If the displayed values are unstable increase the Running Average from the default value of 1. Maximum value is 60. Increasing the running average is useful when measuring unstable sources or when measuring near the zero calibration level described below.

To monitor and record the maximum power level over time, set Max Hold to On. The needle and numeric values will display the maximum recorded value until Max Hold is turned off.

In Cont + Run mode (Figure 6-5), the power meter is continuously measuring and updating the power reading. In Cont + Hold mode, the readings are halted.

In Single + Run mode, the power meter performs the number of readings set in Running Average (default is 1) and then places the instrument in Hold mode. Changing the mode from Hold to Run will initiate another series of readings and then returns the instrument mode to Hold once again.

Calibration

Zero the sensor before making power measurements. If frequent low-level measurements are being made, it is advised to check the sensor zeroing often and repeat as necessary. Before zeroing the sensor, connect it to the DUT (device under test) test port and remove RF power from the connection to a level 20 dB below the noise floor of the power sensor.

For the MA24105A power sensor, this level is less than –20 dBm.

For the MA24106A power sensor, this level is less than –60 dBm.

For the MA24108A, MA24118A, and MA24126A, this level is less than –70 dBm.

It is preferable to leave the sensor connected to the DUT test port so that ground noise and thermal EMF (electro-magnetic fields) are zeroed out of the measurement. The sensor may also be connected to a grounded connector on the DUT or disconnected from any signal source.

Zero Failure

This message appears if the zero operation is unsuccessful. The reason could be the presence of RF power at the input of the sensor.

Turn off the RF input to the sensor or disconnect the sensor from the RF source and try the zero operation again.

1. Press the **Calibration** main menu key and then press the Zero Sensor key.

2. When the process is complete, "Zero Status Ok" will be displayed in the Measurement Setting Summary area.

3. Turn on the RF source of the Device Under Test. The High Accuracy Power Meter will now display the power level of the desired RF signal, with the noise signal subtracted out.

6-4   MA24105A Inline Power Sensor

Note	Refer to the previous sections in this chapter for a general overview of using USB sensors with the Site Master. This section is specific to the additional options and settings available when the MA24105A in-line sensor is attached (Figure 6-2 on page 6-3). There are numerous menu changes with this meter. Refer to Figure 6-21 on page 6-25.

Introduction

Attaching the MA24105A inline peak power sensor adds additional menus and submenus required for making the following in-line measurements:

- Forward Measurements: Average Power, Crest Factor, Peak Envelope Power (PEP), Burst Average Power, and CCDF.

- Reverse Measurements: Average Power, Reflection Coefficient, Return Loss, and VSWR.

In the default view the analog meter displays the forward measurements. The reverse measurements are displayed below the numerical display of the forward measurements (Figure 6-6). To view all of the forward and reverse measurements in table format, use the Summary Table display (Figure 6-7).

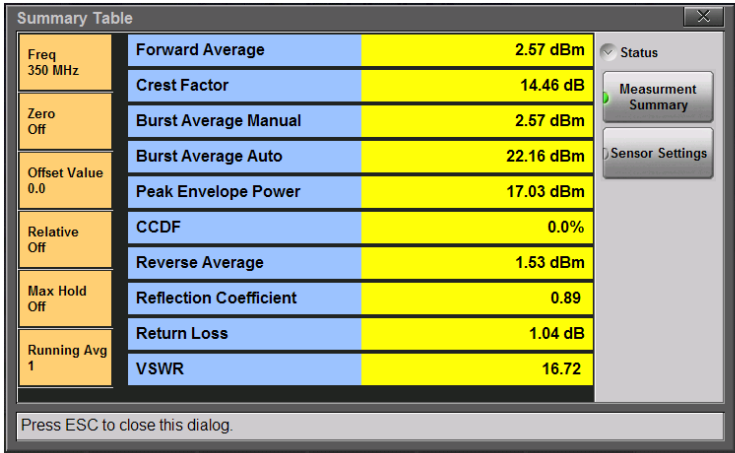

Figure 6-6.   Power Meter View

Summary Table		
Freq 350 MHz	Forward Average	2.57 dBm
	Crest Factor	14.46 dB
Zero Off	Burst Average Manual	2.57 dBm
	Burst Average Auto	22.16 dBm
Offset Value 0.0	Peak Envelope Power	17.03 dBm
Relative Off	CCDF	0.0%
	Reverse Average	1.53 dBm
Max Hold Off	Reflection Coefficient	0.89
	Return Loss	1.04 dB
Running Avg 1	VSWR	16.72

Press ESC to close this dialog.

Figure 6-7.   Summary Table View

In-Line Sensor Setup

The Sensor Settings submenu under the **Display** main menu adjusts the in-line sensor parameters (Figure 6-8). The on screen instructions provide information for each parameter. To change a parameter, select it with the **Up/Down** arrows or the touchscreen and press Edit.

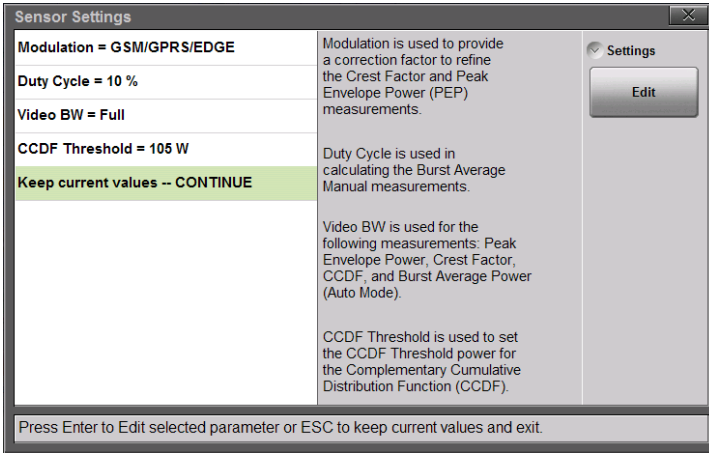| Note	Several sensor settings are only appropriate for specific measurements. Refer to the on screen information in the Sensor Settings dialog for additional information.

Figure 6-8. Sensor Settings

Modulation

In the Sensor Settings dialog, highlight the Modulation = ... row and press Edit. Use the **Up/Down** keys, rotary knob or touchscreen to highlight the desired modulation type, and then press Select.
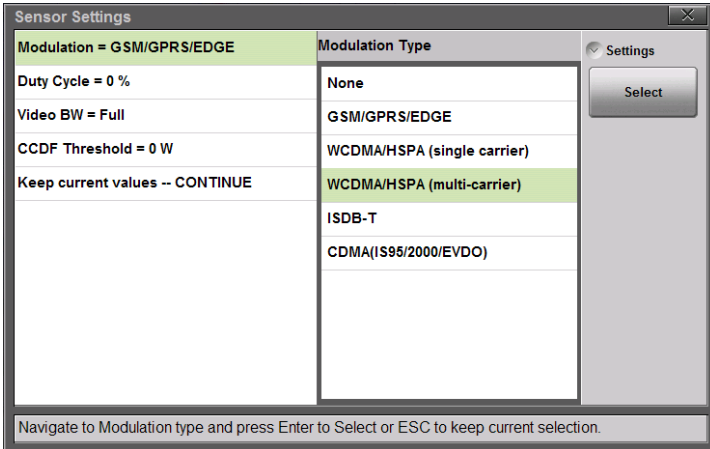

Figure 6-9. Sensor Settings

The selection of a specific modulation type provides a correction factor to refine the PEP calculation.

Duty Cycle

Sets the duty cycle used for averaging when the forward measurement is set to Burst Average Manual. Select a value from 0% to 100%. In the Sensor Settings dialog, highlight the Duty Cycle = ... row and press Edit. Use the **Up/Down** keys, rotary knob or key pad to set the duty cycle and then press **Enter**.

Video Bandwidth

Sets the Video Bandwidth span used in several forward measurements. In the Sensor Settings dialog, highlight the Video BW = ... row and press Edit. Use the **Up/Down** keys, rotary knob or touchscreen to highlight the desired View BW and then press Select.

CCDF Threshold

Sets the power threshold value used in the Complementary Cumulative Distribution Function (CCDF) forward measurement. CCDF describes the probability that the signal power is greater than the user-define threshold value. In the Sensor Settings dialog, highlight the CCDF Threshold ... row and press Edit. Set the desired value and press one of the units of measure buttons to complete.
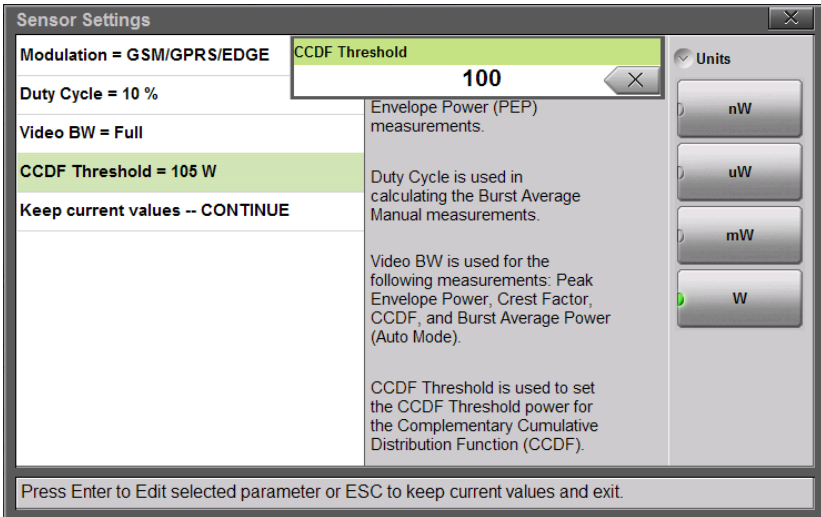

Figure 6-10. CCDF Threshold

Displayed Measurements

Select the forward and reverse measurements to display in the graph area (the analog graph always shows the forward measurement). Select Forward Display and/or Reverse Display under the Display main menu and choose a measurement. See Figure 6-8 for examples of measurement combinations. Refer to "Forward Menu" on page 6-27 and "Reverse Menu" on page 6-28 for additional information.
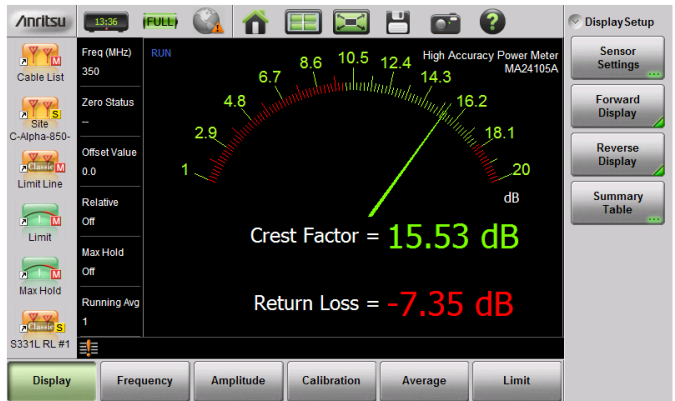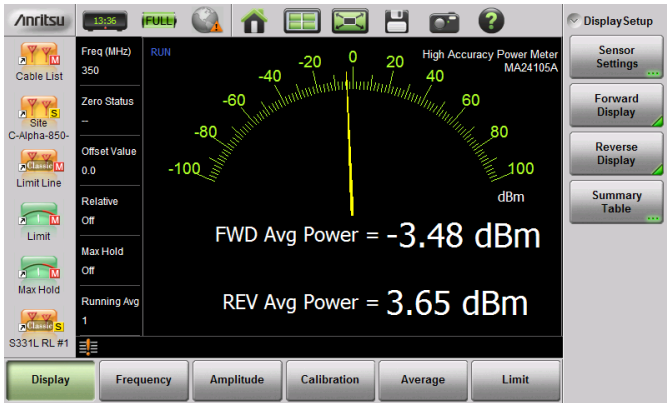

Figure 6-11. Forward and Reverse Measurement Combinations

Summary View

The Summary Table button under the **Display** main menu provides a summary of Site Master instrument settings, DUT forward and reverse measurements, and sensor settings (Figure 6-12).

Figure 6-12. Summary Table

Note	Modifying sensor settings is described in "In-Line Sensor Setup" on page 6-13.

Displaying Relative Power

Use the following procedure to select Relative Power through the Amplitude menu.

1. With the desired base power (reference) levels connected to the USB in-line sensor, press the **Amplitude** main menu key.

2. Press the Fwd Relative and/or Rev Relative submenu keys.

3. Any change in either forward or reverse power will now be displayed relative to the set reference level power. Refer to Figure 6-13.
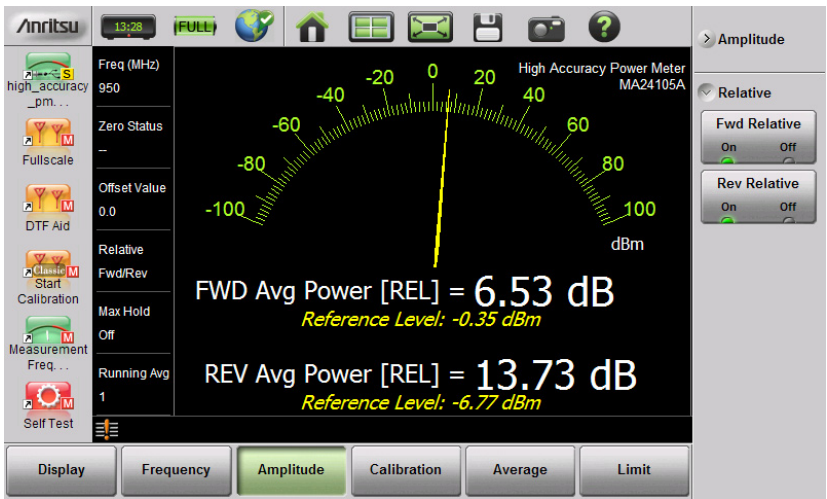

Figure 6-13. Forward and Reverse Relative Power

Limits for Forward and Reverse Measurements

Connecting the MA24105 sensors enhances the limit menu by providing upper and lower limits for both forward and reverse measurements.

1. Press the **Limit** main menu key and set Limit to On.

2. Press the Fwd Upper Value submenu key and use the keypad, **Up/Down** arrow keys, or the rotary knob to set the limit. Then press **Enter**.

3. Repeat Step 2 for Fwd Lower Value, Rev Upper Value, and Rev Lower Value.

The text color of the numeric power level displayed below the graph changes based on the current limit settings:

- **White text:** Limits are turned off.

- **Green text:** Limits are on and the current measured value is within limits.

- **Red text:** Limits are on and the current measured value is not within limits.
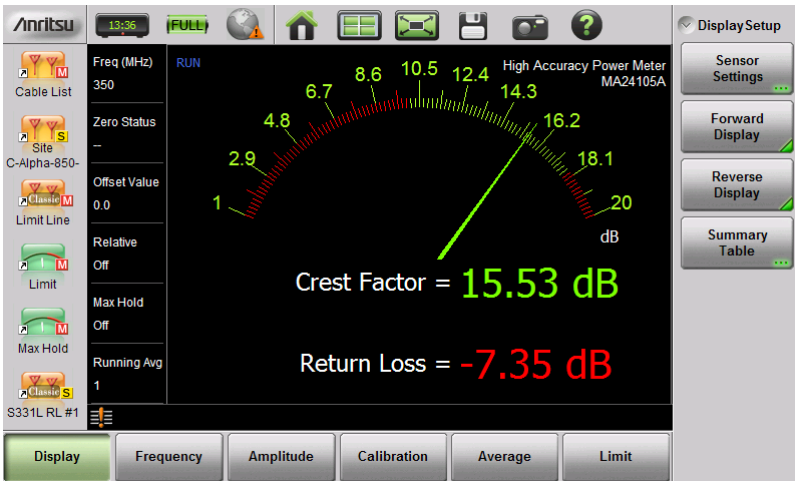
Figure 6-14. Measurement Value Beyond Reverse Limits Indicated by Red Text

6-5   High Accuracy Menus

Figure 6-15 shows the map of the High Accuracy Power Meter menus. The following sections describe main menus and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.

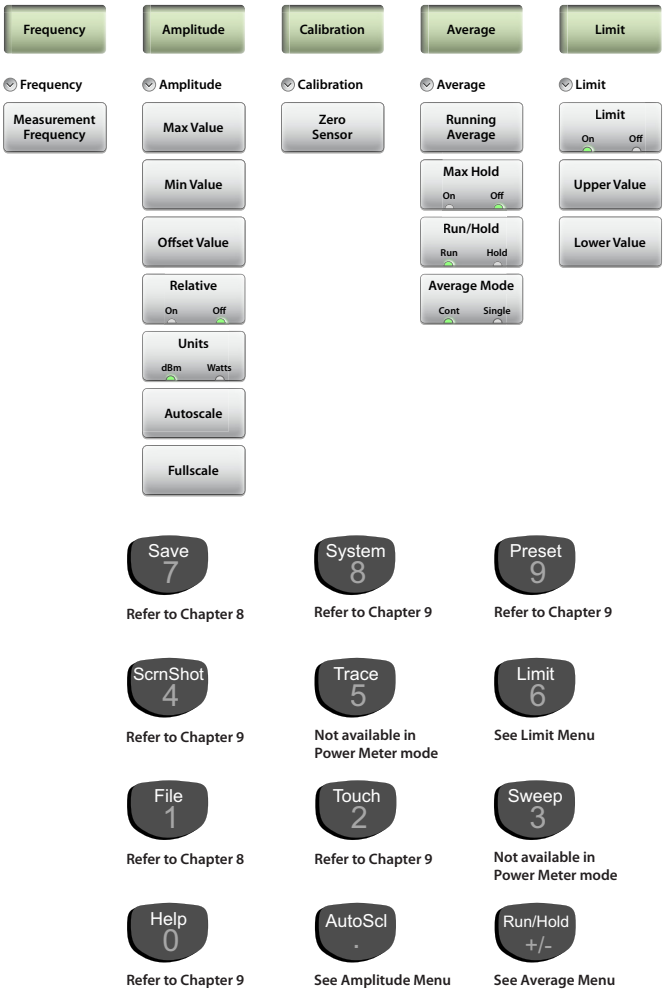| **Note**	MA24105A sensor menus in Section 6-11 on page 6-25

Figure 6-15. High Accuracy Power Meter Menus

6-6   Frequency Menu

Key Sequence: **Frequency**

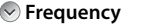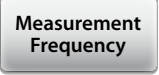|	
Frequency ⊘ **Frequency** **Measurement Frequency**	**Measurement Frequency:** Sets the frequency at the center of the measurement. Frequencies can be entered using the keypad and then selecting a unit (GHz, MHz, kHz, or Hz) submenu key or by using the rotary knob, or the **Up/Down** arrow keys and pressing **Enter** to set the frequency, or **Esc** to restore the previous setting.

Figure 6-16. High Accuracy Power Meter Frequency Menu

6-7   Amplitude Menu

Key Sequence: **Amplitude**

Amplitude ⊘ **Amplitude** **Max Value** **Min Value** **Offset Value** **Relative** On Off **Units** dBm Watts **Autoscale** **Fullscale**	**Max Value:** Sets the maximum value on the display in dBm or Watts. **Min Value:** Sets the minimum value on the display in dBm or Watts. **Offset Value:** Used to set external power attenuation or gain. The displayed power level is offset by the dB value entered. **Relative On Off:** Press this submenu key to toggle relative power On or Off. This measurement shows the relative level of the current power level to the level when relative was turned on. When ON, the message **Relative On** shows in the message area. **Units dBm Watts:** Sets the unit of measure for the power meter. **Autoscale:** Adjusts the Top and Bottom values so that the power meter needle will be shown in the middle of the analog display. **Fullscale:** Adjusts the Top and Bottom values to their maximum allowed values (default settings).

Figure 6-17. High Accuracy Power Meter Amplitude Menu

6-8   Calibration Menu

Key Sequence: **Calibration**

Calibration ⊘ **Calibration** **Zero Sensor**	**Zero Sensor:** Initiates the zero calibration of the sensor. A message box is displayed with further instructions. Refer to "Calibration" on page 6-10 for additional information.
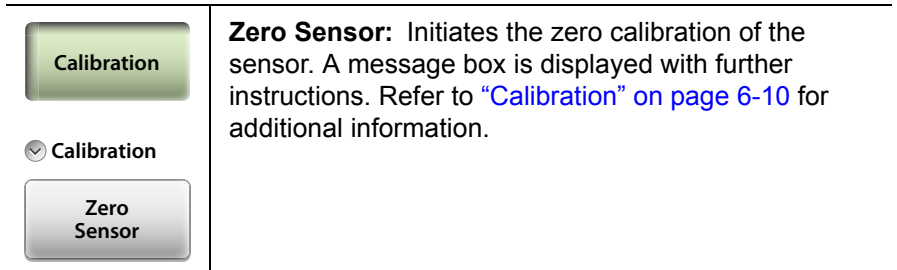
Figure 6-18. High Accuracy Power Meter Calibration Menu

6-9   Average Menu

Key Sequence: **Average**

Average ⊘ **Average** **Running Average** **Max Hold** On Off **Run/Hold** Run Hold **Average Mode** Cont Single	**Running Average:** Sets the number of measurements used in calculating the average. Also sets the number of measurements made when Average Mode if set to Single and Run/Hold is toggled from Hold to Run. Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. Press **Enter** to set, or press **Esc** to restore the previous setting. **Max Hold:** Setting Max Hold to On will only display the maximum power level. Turning Max Hold Off will display the current power level. **Run/Hold:** Toggles between Run and Hold. When in Hold mode, pressing this key starts the measurements and provides a trigger. When in the Run mode, pressing this key pauses the sweep. **Average Mode:** Toggles between single measurement and continuous measurements. In Single, each measurement (or series of measurements if Running Average is greater than 1) must be activated by the Run/Hold key.

Figure 6-19. High Accuracy Power Meter Average Menu

6-10   Limit Menu

Key Sequence: **Limit** or **Limit** (6)
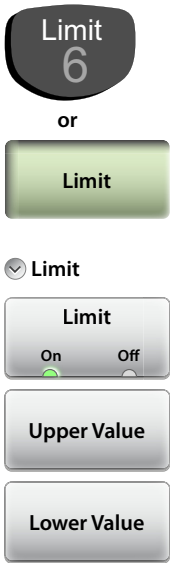
Limit: Turns the limits On or Off.

Upper Value: Sets the upper limit (displayed as red hash marks). Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting.

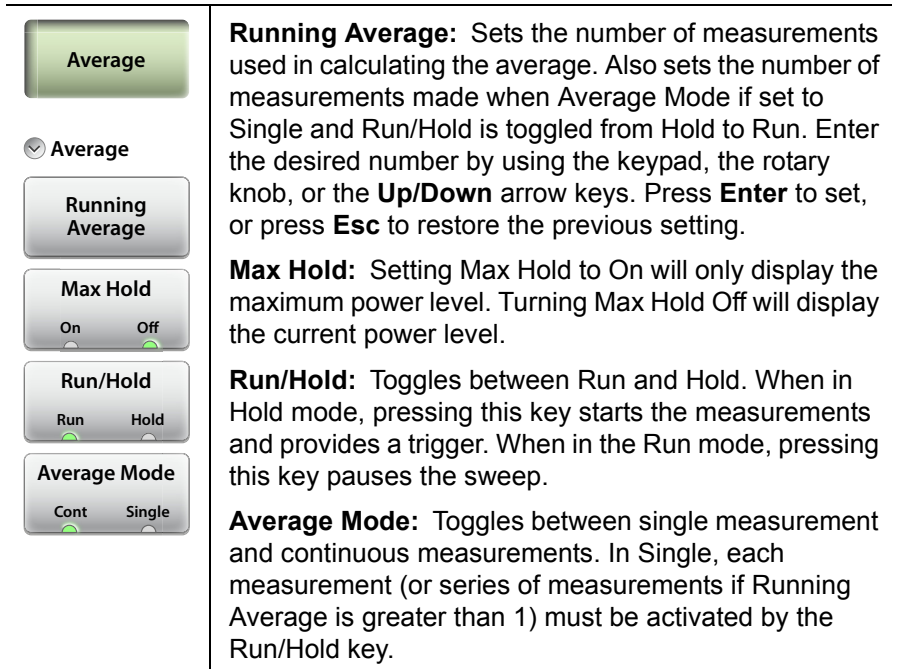**Lower Value:** Sets the lower limit (displayed as red hash marks). Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting.

Figure 6-20. High Accuracy Power Meter Limit Menu

6-11 MA24105A Menus

Figure 6-15 shows the map of the High Accuracy Power Meter menus when the MA24105A sensor is attached to the Site Master. The following sections describe main menus and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.
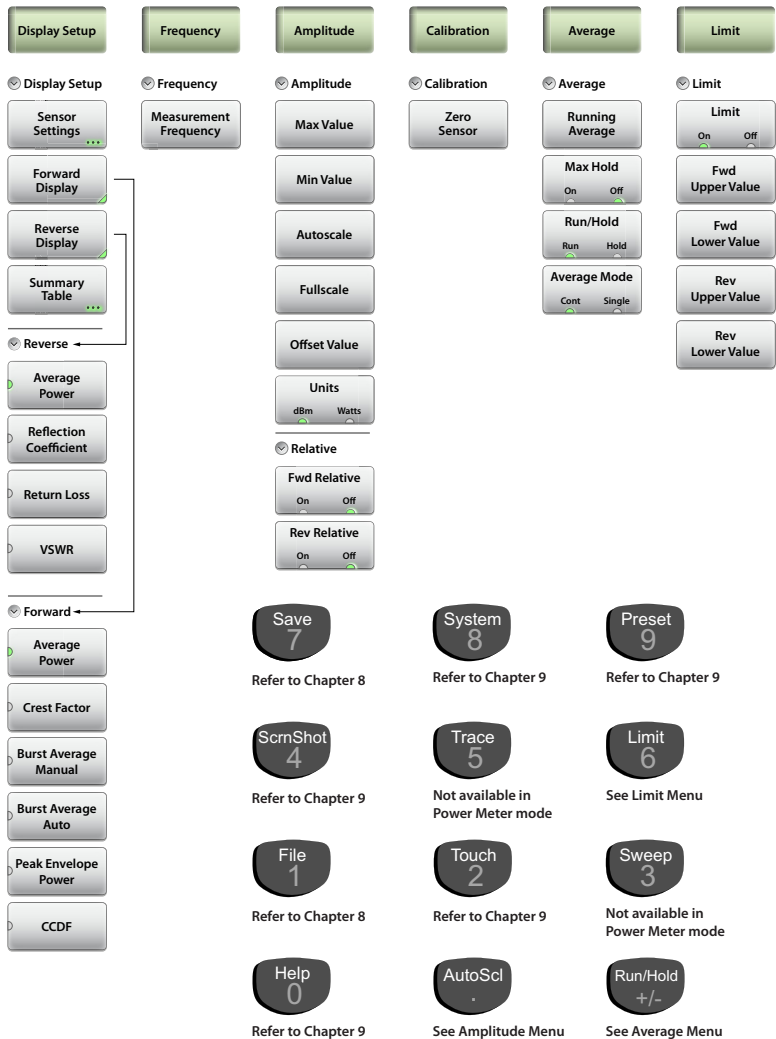

Figure 6-21. High Accuracy PM (MA24105A) Menus

6-12   Display Setup Menu

Key Sequence: **Display Setup**
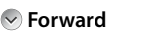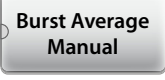
Display Setup ⊙ **Display Setup** **Sensor Settings** ... **Forward Display** **Reverse Display** **Summary Table** ...	**Sensor Settings:** Displays the Forward Settings table (Figure 6-8) for the MA24105A sensor. Select a sensor parameter using the **Up/Down** arrow keys or the touchscreen. Press Edit to change the value of the selected parameter. **Forward Display:** Displays the forward measurement options shown in "Forward Menu" on page 6-27. **Reverse Display:** Displays the reverse measurement options shown in "Reverse Menu" on page 6-28. **Summary Table:** Displays a summary of Site Master instrument settings, USB sensor settings, and DUT forward and reverse measurements (Figure 6-12).

Figure 6-22. High Accuracy PM (MA24105A) Display Setup Menu

Forward Menu

Key Sequence: **Display Setup** > Forward

Display Setup	**Average Power:** Press this submenu key to have the sensor measure the average power in the forward direction.
⊘ **Forward**	**Crest Factor:** Press this submenu key to have the sensor measure the Crest Factor in the forward direction. Crest Factor is a ratio of peak power to RMS power.
Average Power	
Crest Factor	**Burst Average Manual:** Press this submenu key to have the sensor measure the average power within the signal bursts (in the forward direction). The user defines the duty cycle of the bursts in order to complete the averaging calculation.
Burst Average Manual	
Burst Average Auto	**Burst Average Auto:** Press this submenu key to have the sensor measure the average power within the signal bursts (in the forward direction). In auto, the sensor determines the duty cycle of the bursts in order to complete the averaging calculation.
Peak Envelope Power	**Peak Envelope Power:** Press this submenu key to have the sensor measure the peak power in the forward direction.
CCDF	**CCDF:** Press this submenu key to have the sensor measure the value of the Complementary Cumulative Distribution Function (CCDF). The CCDF describes the probability that the signal power is greater than a threshold value.

Figure 6-23. High Accuracy PM (MA24105A) Forward Menu

Reverse Menu

Key Sequence: **Display Setup** > Reverse

Display Setup	**Average Power:** Press this submenu key to have the sensor measure the average power in the reverse direction.
⊙ **Reverse**	**Reflection Coefficient:** Press this submenu key to measure the reflection coefficient:
Average Power	Reflected Power / Forward Power
Reflection Coefficient	**Return Loss:** Press this submenu key to measure return loss, which is the measurement in dB of reflected energy caused by impedance mismatch. May also be referred to as S11.
Return Loss	**VSWR:** Press this submenu key to measure Voltage Standing Wave Ratio (VSWR), which is another measurement of reflected energy caused by impedance mismatch. Expressed as a ratio of X:1. VSWR measures the voltage peaks and valleys.
VSWR	

Figure 6-24. High Accuracy PM (MA24105A) Reverse Menu

6-13   Frequency Menu

Key Sequence: **Frequency**

Frequency ⊙ **Frequency** **Measurement Frequency**	**Measurement Frequency:** Sets the frequency at the center of the measurement. Frequencies can be entered using the keypad and then selecting a unit (GHz, MHz, kHz, or Hz) submenu key or by using the rotary knob, or the **Up/Down** arrow keys and pressing **Enter** to set the frequency, or **Esc** to restore the previous setting.

Figure 6-25. High Accuracy PM (MA24105A) Frequency Menu

6-14   Amplitude Menu

Key Sequence: **Amplitude**

Amplitude:

Max Value: Sets the maximum value on the display in dBm or Watts.

Min Value: Sets the minimum value on the display in dBm or Watts.

Autoscale: Adjusts the Top and Bottom values so that the power meter needle will be shown in the middle of the analog display.

Fullscale: Adjusts the Top and Bottom values to their maximum allowed values (default settings). **Offset Value:** Used to set external power attenuation or gain. The displayed power level is offset by the dB value entered.

Offset Value: Used to set external power attenuation or gain. The displayed power level is offset by the dB value entered.

Units dBm Watts: Sets the unit of measure for the power meter.

Relative:

Fwd Relative On Off: Press this submenu key to toggle On or Off. This measurement shows the relative level of the current forward power level to the forward power level when Fwd Relative was turned on.

Rev Relative On Off: Press this submenu key to toggle On or Off. This measurement shows the relative level of the current reverse power level to the reverse power level when Rev Relative was turned on.

Note: The message **Relative On** shows in the message area when either Fwd or Rev Relative is on.

Figure 6-26. High Accuracy PM (MA24105A) Amplitude Menu

6-15   Calibration Menu
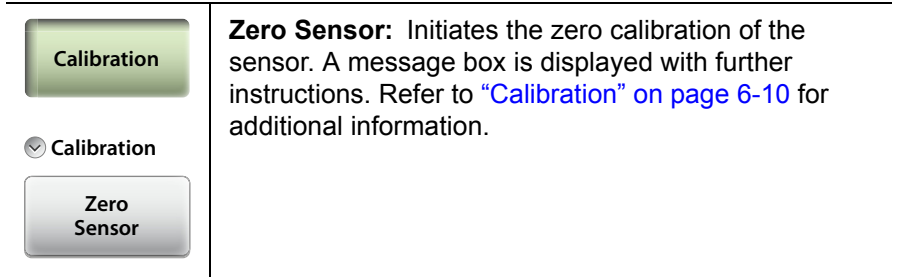
Key Sequence: **Calibration**

Calibration ◡ **Calibration** **Zero Sensor**	**Zero Sensor:** Initiates the zero calibration of the sensor. A message box is displayed with further instructions. Refer to "Calibration" on page 6-10 for additional information.

Figure 6-27. High Accuracy PM (MA24105A) Calibration Menu

6-16   Average Menu

Key Sequence: **Average**

Average ◡ **Average** **Running Average** **Max Hold** On Off **Run/Hold** Run Hold **Average Mode** Cont Single	**Running Average:** Sets the number of measurements used in calculating the average. Also sets the number of measurements made when Average Mode if set to Single and Run/Hold is toggled from Hold to Run. Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. Press **Enter** to set, or press **Esc** to restore the previous setting. **Max Hold:** Setting Max Hold to On will only display the maximum power level. Turning Max Hold Off will display the current power level. **Run/Hold:** Toggles between Run and Hold. When in Hold mode, pressing this key starts the measurements and provides a trigger. When in the Run mode, pressing this key pauses the sweep. **Average Mode:** Toggles between single measurement and continuous measurements. In Single, each measurement (or series of measurements if Running Average is greater than 1) must be activated by the Run/Hold key.

Figure 6-28. High Accuracy PM (MA24105A) Average Menu

6-17 Limit Menu

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

Limit ⊘ **Limit** **Limit** On Off **Fwd Upper Value** **Fwd Lower Value** **Rev Upper Value** **Rev Lower Value**	**Limit:** Turns the limits On or Off. **Fwd Upper Value:** Sets the forward measurement upper limit (displayed as red hash marks). Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting. **Fwd Lower Value:** Sets the forward measurement lower limit (displayed as red hash marks). Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting. **Rev Upper Value:** Sets the reverse measurement upper limit. Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting. **Rev Lower Value:** Sets the reverse measurement lower limit. Enter the desired number by using the keypad, the rotary knob, or the **Up/Down** arrow keys. If the keypad was used to enter new values, press **Enter** to set the new setting or press the **Esc** button to restore the previous setting.

Figure 6-29. High Accuracy PM (MA24105A) Limit Menu

6-18 Sweep Menu

This menu is not available in High Accuracy Power Meter measurement mode.

6-19   Trace Menu

This menu is not available in High Accuracy Power Meter measurement mode.

6-20   Other Menus Keys

Refer to Table 2-1, "Site Master Keypad Functions" on page 2-10.

Chapter 7 — Calibration

7-1   Introduction

This chapter provides details and procedures for calibrating the Cable-Antenna Analyzer modes of the Site Master S331L. Topics include calibration options Internal InstaCal, External Open-Short-Load (OSL), Transmission using External Sensor, Standard Cal, and FlexCal.

Anritsu recommends connecting a phase-stable test port cable (3 meters maximum length) to the RF Out/Reflect In connector and calibrating at the open end of the cable using the Site Master S331L internal InstaCal or 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 7-1 on page 7-2 compares the Return Loss measurement of an open phase-stable cable before and after calibration.
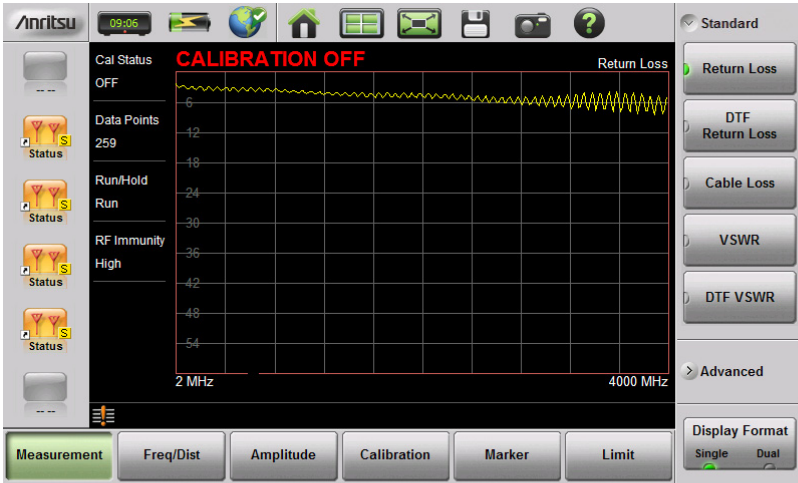
Before Calibration (0 dB to 60 dB)
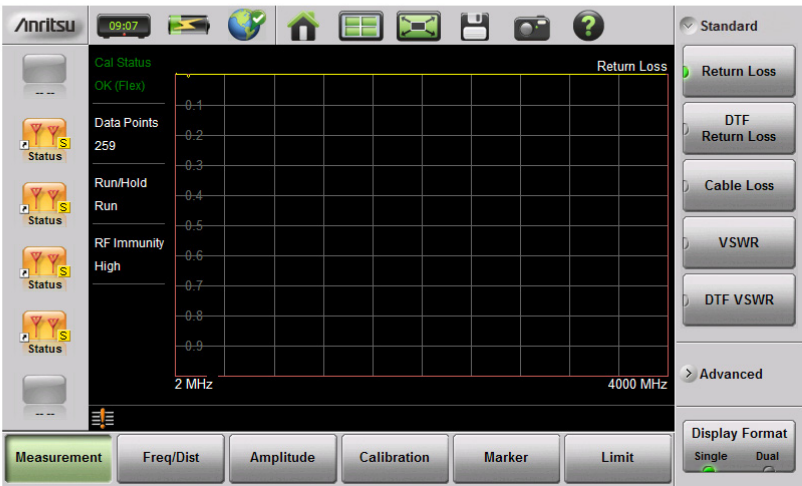
After Calibration (0 dB to 1 dB)

Figure 7-1.   Comparison of Test Port Cable Before and After Calibration

7-2   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 ºC) or when the test port extension cable is removed or replaced. Unless the calibration type is FlexCal, the instrument must also be re-calibrated every time the frequency range changes.

For all measurement types other than the Transmission (Ext. Sensor), the instrument can be manually calibrated with an external precision OSL (Open-Short-Load) calibration tee/discrete components or with the standard internal InstaCal. The benefit of the InstaCal module is that it is much faster, requires no connection changes, and eliminates the need to use three different terminations (open, short, load) for calibration. The trade-off is that the specified corrected directivity is 38 dB instead of 42 dB.

For transmission measurements with an external sensor, a different calibration method is used – Transmission (Ext. Sensor). For this method, a normalization process is used to calibrate the frequency response of the sensor and any test port cables/adapters used. The calibration method uses the sensor itself and does not require any additional components. An optional zeroing step is performed to remove any residual noise in the sensor, and then, a normalization step is performed by connecting the sensor directly to the port (or test port cables).

To support both types of measurements (1-port reflection and 2-port transmission), the S331L provides a combined calibration method: OSL + Transmission (Ext. Sensor). Choosing this calibration method allows the instrument to be calibrated for all the types of measurements that it supports. This enables the user to switch between multiple types of measurements (Return Loss and Transmission, for example) without having to recalibrate the instrument.

While OSL Cal tee, InstaCal, or Tranmission (Ext. Sensor) provide alternatives for the tools needed to perform the calibration, Standard Cal or FlexCal 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. FlexCal is a broadband frequency calibration that remains valid if the frequency is changed.

FlexCal 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 7-1 has a summary comparing the OSL and InstaCal methods for both Standard and FlexCal settings.

Table 7-1.   Summary of Calibration Methods and Tools

	Calibration Tool	
Calibration Type	**External OSL (Tee or Separate Components)**	**Internal InstaCal**
Standard Cal (recalibrate every time frequency is changed)	Most Accurate Cal Method/ Need to recalibrate if frequency changes. This will provide the best accuracy. Recommended for reporting.	Fastest Calibration Method. Need to recalibrate if frequency changes. Fast cal method. Recommended for reporting.
FlexCal (no need to recalibrate when frequency is changed)	Most accurate cal method. No need to recalibrate if frequency changes. Recommended for troubleshooting.	Fastest Cal Method / No need to re-calibrate if frequency changes. This is the fastest and most convenient combination. Recommended for troubleshooting.

7-3   Calibration Procedures

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

Note	If a Test Port Extension Cable is to be used (recommended), it must be connected to the Site Master before calibration. Follow the same calibration procedures with the OSL components, the InstaCal module, or the External Sensor in place at the end of the test port extension cable.

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 FlexCal.

4. Select the Cal Method to be OSL, InstaCal, Transmission (Ext. Sensor), or OSL + Transmission (Ext. Sensor).

5. Press Measure and follow the on-screen instructions (Figure 7-2 on page 7-6).

6. Verify that the calibration has been completed by confirming that the Cal Status message is now displaying the following:

- `Cal Status OK (RFP1)` or `iCal Status OK (RFP1)` for 1-port standard or flex reflection calibrations using either OSL or InstaCal.

- `Cal Status OK (TRES)` or `iCal Status OK (TRES)` for Transmission standard or flex calibrations

- `Cal Status OK (2PES)` or `iCal Status OK (2PES)` for combined OSL + Transmission standard or flex calibrations

7. The calibration correction factor will now be applied to the measurements.
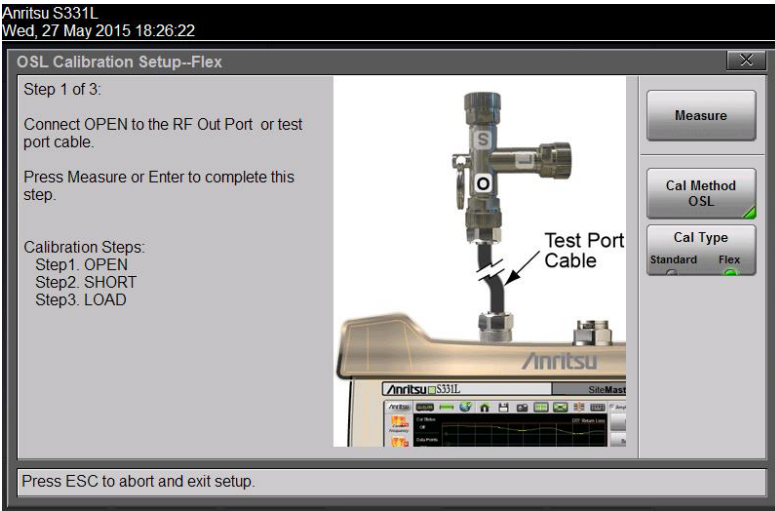
Figure 7-2.   Calibration Setup OSL Cal

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 7-3). Press **ESC** to close.

Figure 7-3.   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.

Note	The InstaCal module is not a discrete calibration component and it can not be used at the top of the tower to perform line sweep measurements.

7-4   InstaCal Module Verification

InstaCal module verification identifies any failures in the module due to circuitry damage or failure of the control circuitry. This test does not attempt to characterize the InstaCal module, which is performed at the factory or the service center.

The verification compares a precision load against the InstaCal module and provides a baseline for other field measurements. A precision load provides better than 42 dB directivity.

1. Set the Site Master frequency range for the device under test.

2. Press the **Measurement** main menu key and select Return Loss.

3. Connect the RF Out/Reflect In port to the InstaCal/Power Meter port using a short phase-stable test port cable. Calibrate using InstaCal and Standard. Refer to "Calibration Procedure" on page 7-5 for details.

4. Remove the cable from the InstaCal/Power Meter port and connect a precision load to the end of the cable.

5. Measure the return loss of the precision load. The level should be better than 38 dB across the calibrated frequency range.

7-5   Calibrate Menu

Key Sequence: **Calibration**

Calibration
 	
⌄ Calibration
 	
Start Calibration ...
 	
Cal Info ...
 	
Cal Correction On   Off
 	
Measure
 	
Cal Method OSL
 	
Cal Type Standard   Flex
	Start Calibration: Press this submenu key and follow the instruction on screen.
	
	    Measure: Starts the calibration process.
	
	    Cal Method: Select one of the choices presented – OSL, InstaCal, Transmission (Ext. Sensor), or OSL + Transmission (Ext. Sensor). Refer to "Calibration Methods" on page 7-3.
	
	    Cal Type: Toggles between Standard Cal and FlexCal. See Table 7-1 on page 7-4 for details.
	
	Cal Info: Displays information about the current settings and active cal settings. Refer to Figure 7-3 on page 7-6.
	
	Cal Correction On Off: Determines whether the active cal is applied to the current measurement.

Figure 7-4.   Calibration Menu

Chapter 8 — File Management

8-1   Introduction

This chapter reviews the file management features of the Site Master S331L. The associated menus and submenus allow you to save, recall, rename, copy, and delete files in internal memory or on an external USB drive.

The File menu is accessed by pressing the **File** (1) keypad menu key. In Video Inspection Probe (VIP) mode, you can alternatively press the Save/Recall main menu key on the touchscreen.

8-2   Overview

Remember the following tips when reviewing this chapter:

- 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.
- Rename saved files under the file management (**File** > File Mgmnt) menu.
- Sort files by tapping the column headings.
- Quickly move up or down long lists using the buttons under the Navigation submenu.
- Set the location to save files (Internal or USB) with the Set Location button in the File Save submenu (**Save** > Location).
- Use the Left arrow key to move out of a folder.
- Use the Right arrow key to move inside of a highlighted folder.
- Press **Esc** to return to the previous screen.

8-3   File Types

Filename extensions that are used in the Site Master S331L:

- `*.dat` for Cable and Antenna measurement files
- `*.pm` for Power Meter measurement files
- `*.hipm` for High Accuracy Power Meter measurement files
- `*.ett` for easyTest files
- `*.stp` for Setup files
- `*.png` for Screen Shot files
- `*.txt` for saving Status information and Self Test results
- `*.vipi` for Video Inspection Probe measurement files

8-4   Save Files

Press the **File** (1) keypad menu key, then press Save to display the Save dialog box. Alternatively, you can press **Save** (7) or the Save icon in the "System Function Tool Bar". In Video Inspection Probe mode, the Save icon automatically applies the current auto filename settings, if enabled, to the saved file (see Figure 13-4 on page 13-5).
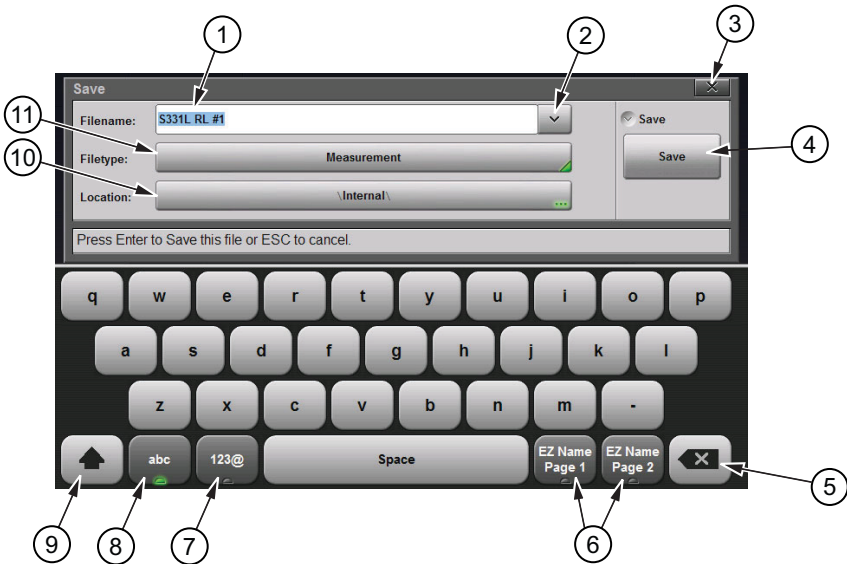
Figure 8-1.   Save Dialog Box (1 of 2)

| 1	Current Filename (ready for editing). Refer to "Choose the File Name" on page 8-7.
2	Recent Filenames (tap to view)
3	Close Dialog Box Without Saving File
4	Save File and Close
5	Delete Filename Character Key
6	EZ Name Keys. Refer to "EZ Name Matrix" on page 8-8.
7	Symbols and Numbers Keyboard
8	Letters Keyboard
9	Shift Key
10	Current Save Location. Tap to Change. Refer to "Set the Save Location" on page 8-3.
11	Current Filetype. Tap to Change. Refer to "Set the File Type" on page 8-6.

Figure 8-1.   Save Dialog Box (2 of 2)

Set the Save Location

Navigate within a location in Internal Memory or a USB flash drive, then press Set Location. The selected save location is displayed. In Figure 8-2, the bread crumb shows that pressing Set Location will set the location to the root level of the internal memory (even if a subfolder is highlighted).

1. Press the **Location** button shown in Figure 8-1 on page 8-2 and select where to save the file. The default location is the Site Master internal memory (Figure 8-2).
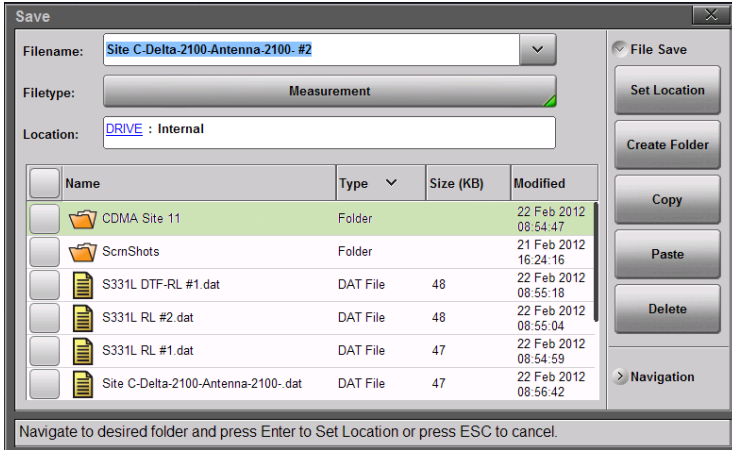
Figure 8-2.   Default Save Location

2. Files can also be saved to an external USB flash drive. Insert a USB flash drive into the Site Master USB Type-A connector (Figure 2-2) and double-tap on DRIVE: (Figure 8-2) to display the top navigation level showing both the internal memory and the external USB drive (Figure 8-3 on page 8-5).
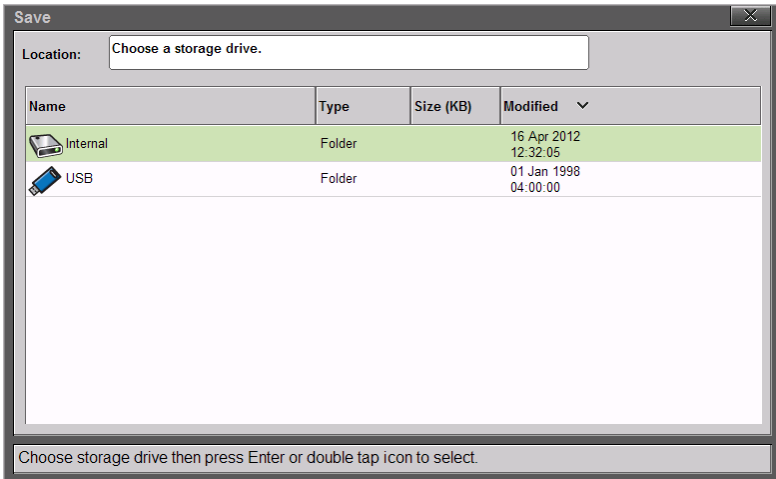
Figure 8-3.   Choose a Storage Drive

3. Double-tap on the USB flash drive icon and, if desired, create folders for the saved files. Press the Set Location button. The location for saving is now set to the external USB drive (\USB). Refer to Figure 8-4 on page 8-5.
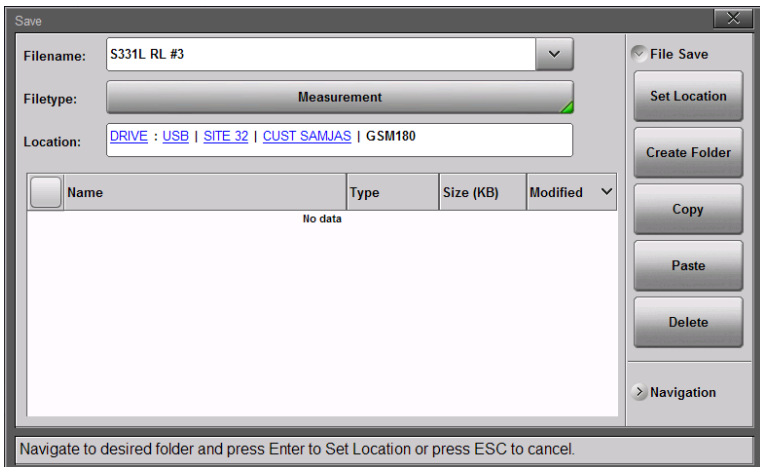

Figure 8-4.   Save Location Set to Folder in the External USB Drive

Note	Folders and subfolders can be created and renamed in either storage location.

Set the File Type

The next step after setting the save location is choosing the file type to save.

In the Save dialog box (**File** (1) > Save) press Filetype, then select Measurement, Setup, or ScreenShot (Figure 8-5 on page 8-7). The default file type is Measurement.

Measurement (.dat) is the default setting. Measurement files are typically saved for reporting and monitoring. Measurement files contain all the measurement data and setup data described below (except for the calibration coefficients). They can be recalled and viewed on the instrument and a static trace or measurement can be viewed and edited on a PC with Line Sweep Tools (Chapter 11).

Note	In Video Inspection Probe mode, the Measurement file type (.vipi extension) saves the captured VIP image and analysis results. Refer to Chapter 13, "Video Inspection Probe (VIP)".

Setup (.stp) files are typically saved for later recall. Saving setup files helps ensure consistent instrument setup when making future measurements. 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 and RF immunity status).

Screen shot (.png) files are typically saved for reporting. The files contain a screen capture of the current display. The "look" of the file is set using the "Display/Audio Menu" on page 9-19.
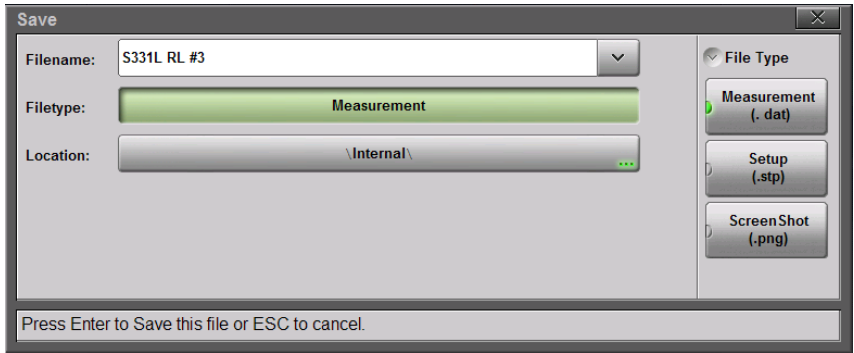
Figure 8-5. Set the File Type

Choose the File Name

Default Name

The Site Master adds a default file name based on the instrument model and current measurement type.

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
PM = Power Meter
HiPM = High Accuracy Power Meter

Additional measurements of the same type will have a number appended to the file name (#1, #2, etc.).

Press Save or **Enter** to save the file.

Note	A Filetype extension (Figure 8-5) is automatically added to the Filename based on the chosen Filetype.

Custom Name

Replace the default file name using the on screen keyboard or the numeric keypad. The highlighted filename (blue background) is ready for replacement. Tap the ▲ key for UPPERCASE letters. The ⌨️ key (row 7 in Figure 8-1 on page 8-2) will display commonly used symbols, delimiters, and numbers.

Use the Left or Right arrow keys to move the text cursor within the filename characters. The ⌫ key deletes the character directly to the left of the cursor.

EZ Name Matrix

The EZ Name Matrix buttons display the EZ Name Grids which allows contractors and field personnel to save time entering files names when they are making measurements.

Often carriers require file names to be reported in special conventions including site number, sector information, color coding, measurement type, termination device, and frequency information. Setup the buttons in this matrix to quickly enter the required file name.

Using the touchscreen, press either EZ Name Page 1 or EZ Name Page 2 shown in Figure 8-6 to open the EZ Name Matrix keyboards.

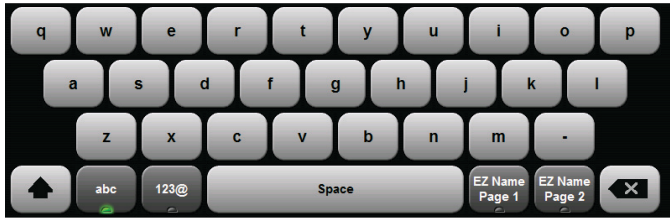| Note	The EZ Name Separator Keys shown in Figure 8-6 can be used to automatically insert a separator each time a Matrix button is pressed.
	The top button toggles the separator on or off. The button below allows the user to choose beween using a dash "-" or an underscore "_" as the separator.
	Naming Examples:
	Separator Off: Site AAlphaColor CodeRLShort700
	Separator On: Site A-Alpha-Color Code-RL-Short-700 *or* Site A_Alpha_Color Code_RL_Short_700

EZ Name Buttons

EZ Name Page 1 Matrix

EZ Name Button Separator Keys

EZ Name Page 2 Matrix
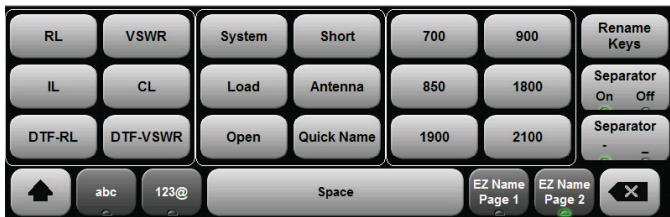
Figure 8-6.   EZ Name Matrix

Change Default Matrix Names

1. Press the Rename Keys button shown in Figure 8-6 and select the
matrix button to rename. In Figure 8-7 the upper-right button
"Color Code" was selected and renamed "GREEN".
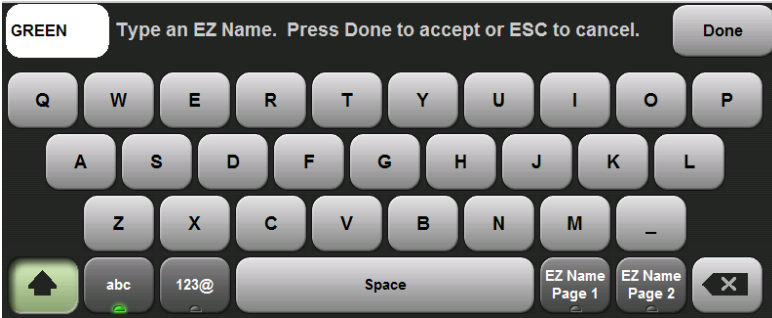
Figure 8-7.   Renaming a Matrix Key

2. Press Done and the new name will appear in the Matrix
(Figure 8-8).

Figure 8-8.   Renamed Matrix Key

3. Continue with renaming additional matrix keys as necessary.

After the keys have been labeled as needed, they can be used to quickly
create filenames with the required file naming conventions. Select the
type of file and press Enter to save the file.

Note	A user-defined EZ Name matrix is saved in internal memory and will be available for future use until the custom file is deleted or a Master Reset is performed. Refer to the "Preset Menu" on page 9-24 for additional information.

Saving

1. After setting the location and file type, press Save.

2. The selected location and file type is now set for saving additional files.

| Note	Anritsu recommends creating a new folder for each test site and saving all of the measurements for that specific site in the created folder.
	The Site Master offers an EZ Name grid for quickly naming measurement files. Refer to "EZ Name Matrix" on page 8-8 for additional information.
	Often used setup files can also be created and saved in a user-defined "Setup" folder.

Additional Menus

Pressing Location opens the Save dialog box (Figure 8-4) and displays the File Save and Navigation submenus. These functions are detailed in "File Mgmnt Menu" on page 8-30.

8-5   Recall Files

The Recall menu enables you to recall a measurement file or a setup file from internal memory or an external USB drive. Recall also allows the user to preview saved image files. Refer to the "Recall Menu" on page 8-28 for additional information.
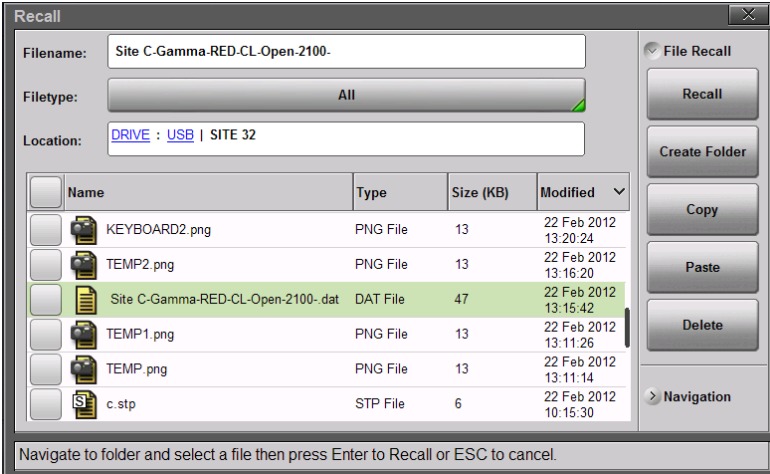
Figure 8-9.   Recall Menu

Note	Recalling a measurement or setup may change the current instrument settings, and may turn off any current calibration correction. Consider saving the current setup before recalling a file.
	Only one file (of any type) can be recalled at a time.

Recall a Measurement

Press the **File** (1) keypad menu key to display the File menu, then press Recall to open the Recall dialog box. Select the measurement file (.dat extension) using the touchscreen, rotary knob, or the **Up/Down** arrow keys, then press **Enter** (or the Recall submenu key).

Recalled measurements are first displayed on the Site Master as a preview. Figure 8-10 shows the preview of a saved cable loss measurement, S331L CL #1.dat.
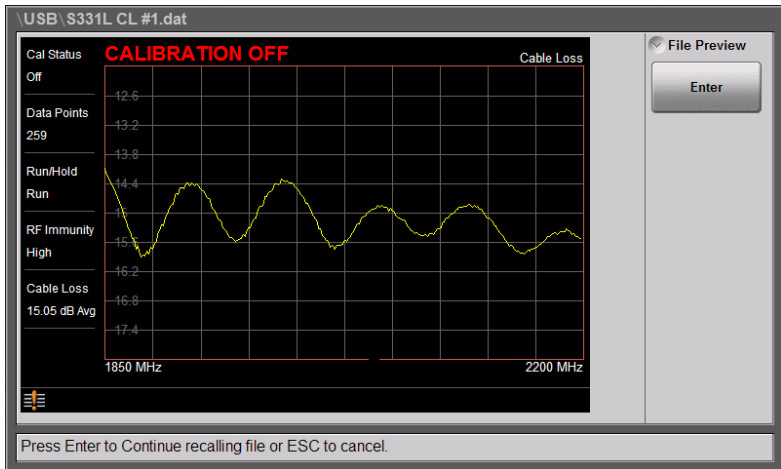

Figure 8-10. Preview of a Recalled Measurement

Press **Enter** to complete recalling the measurement (Figure 8-11) or press **ESC** to cancel the recall and return to the File Recall menu.
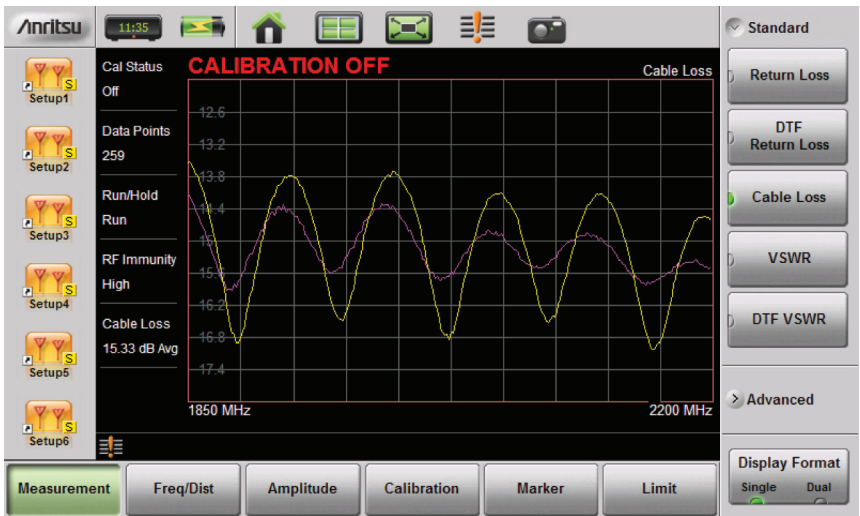

Figure 8-11. Recalled Measurement and Active Trace

The recalled measurement is the purple trace and is overlaid on the current active (yellow) trace. In Figure 8-11 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 3-45.

Recall a Setup

Press the **File** (1) keypad menu key to display the File menu, then press Recall. In the Recall dialog box, confirm that the Filetype is Setup or All. Select the setup file (.stp extension) with the touchscreen, rotary knob, or **Up/Down** arrow keys, then press **Enter** (or the Recall submenu key).

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 and RF immunity status). Recalling a setup may change the current settings.

Recall/Preview a Screen Shot

Press **File** (1), then press the Recall submenu key. Confirm that the Filetype is Screen Shot or All. Select the file (.png extension) with the touchscreen, rotary knob, or the **Up/Down** arrow keys, then press **Enter**.
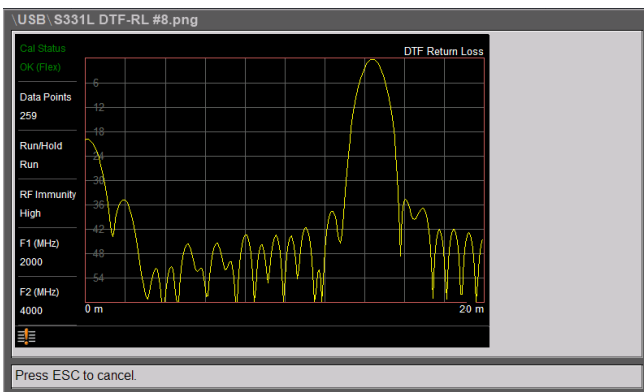
Figure 8-12.   Preview of a Recalled Screen Shot

Press **ESC** to return to the File Recall menu.

Recall a VIP Measurement (VIP Mode Only)

In Video Inspection Probe mode, press the Save/Recall main menu key, then press Recall. Confirm that the Filetype is Measurement or All. See Figure 8-13.
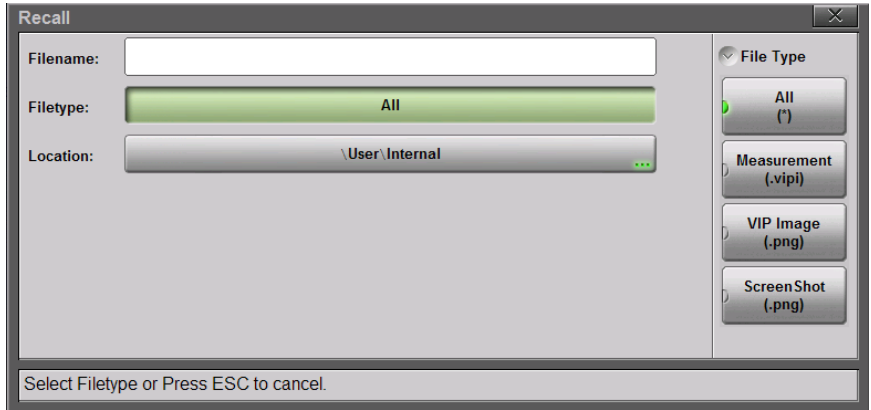
Figure 8-13. Recall File Type (VIP Mode)

Select the file (.vipi extension) with the touchscreen, rotary knob, or the **Up/Down** arrow keys, then press **Enter** (or the Recall submenu key).

Figure 8-14. Recalled VIP Measurement File

Recall a VIP Image (VIP Mode Only)

In VIP mode, press the Save/Recall main menu key, then press Recall.
Confirm that the Filetype is VIP Image or All. Select the file (.png
extension) with the touchscreen, rotary knob, or the **Up/Down** arrow
keys, then press **Enter** (or the Recall submenu key).

Figure 8-15. Recalled VIP Image File

A recalled VIP image can be analyzed and the results included in a VIP
report. Refer to "Measurement Menu" on page 13-13.

8-6   Rename Files

In the File menu, press the File Mgmnt submenu key. Select the file to rename, then press the Rename button under File Mgmnt. See Figure 8-16.
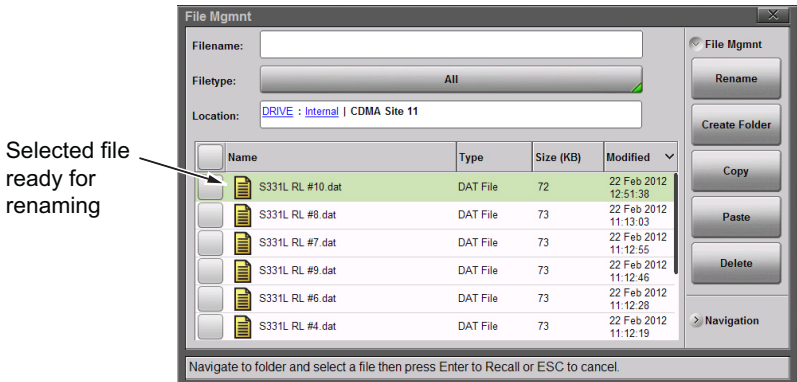
Figure 8-16. Select a File to Rename

Use the onscreen keyboard, the numeric keypad, or the EZ Name grid to rename the file. In this example we'll change the short measurement name that is automatically created by the Site Master to a longer name typical of carrier requirement (Figure 8-17). Use the "EZ Name Matrix" on page 8-8 for this type of renaming.

Rename file from: S331L RL #10.dat
to: Site B-Gamma-RED-DTF-RL-Load-900-.dat.
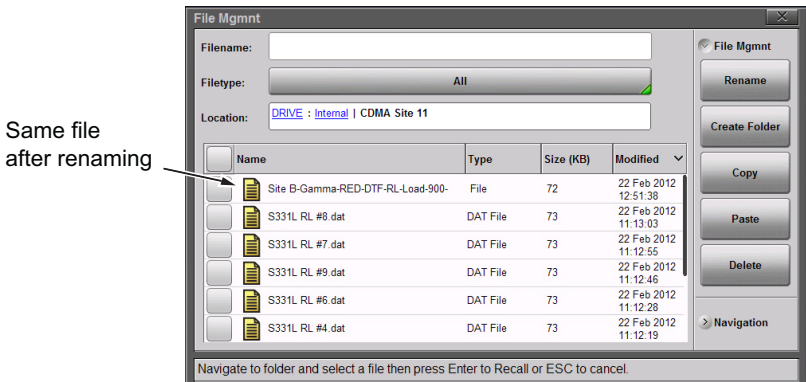
Figure 8-17. Renamed File (Same Modification Date)

8-7   Copy and Paste Files

The Site Master S331L 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 internal memory to an external flash drive.

Note	For user convenience, the Create Folder, Copy, Paste, and Delete buttons are available under each of the File Mgmnt, Recall, and Save submenus.

1. In the File menu, press the File Mgmnt submenu key. Double-tap on the Internal memory icon (see Figure 8-3 on page 8-5).

2. Select the files and folders to copy. Use the checkbox column to select multiple files and/or multiple folders. See Figure 8-18. Use the Navigation submenu buttons as needed to move through a long list of files.
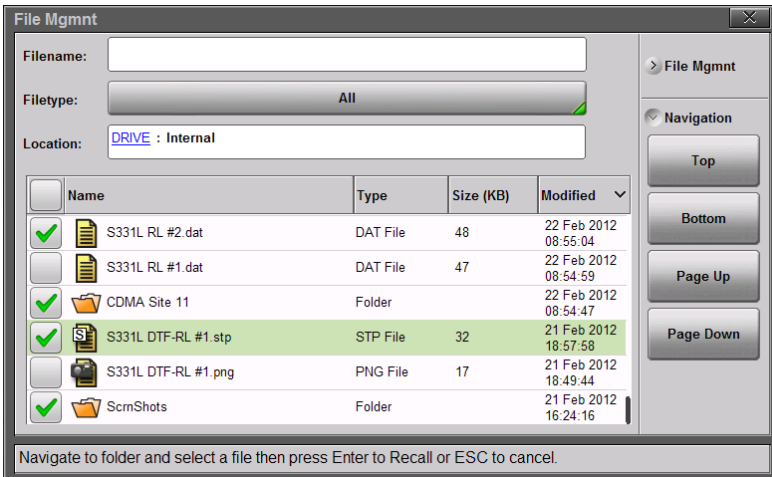
Figure 8-18. Multiple Item Selection

3. Under File Mgmnt, select Copy.

4. Insert a USB flash drive into one of the Site Master's USB ports.

5. Press the **Left Arrow** key or double-tap on Drive to display the external USB drive icon. Double-tap on the USB drive icon.

6. Select **Paste** to either copy or move the selected files and folders from Internal memory to the USB drive. See Figure 8-19.
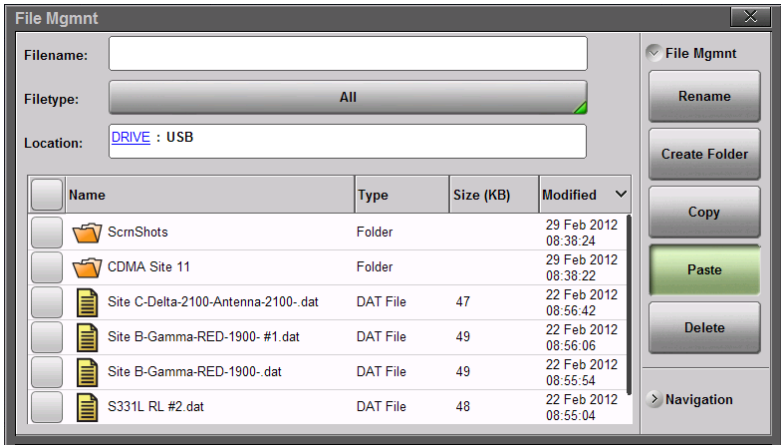
Figure 8-19. File Management Screen

7. In the Paste Selection message box, press **Paste** or **Move**, as appropriate. See Figure 8-20. **Paste** will create duplicate copies in the destination folder. **Move** will place copies in the destination folder and remove the selected files from the source location.

Figure 8-20. Paste Selection

8. If files with the same name already exist in the destination folder, a warning will appear that requires the user to select whether to overwrite some or all of the files.
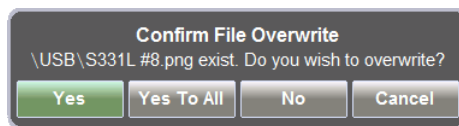
Figure 8-21. Paste Warning

9. After pasting is completed, the USB drive can be removed. No Eject command is required to remove the drive.

Note	Files are removed from Site Master clipboard memory after pasting. The Site Master does not allow concurrent pasting.

8-8   Delete Files

The Site Master S331L allows multiple files and folders to be deleted at the same time from either internal memory or an external USB drive.

The example below describes deleting all the files from a folder in internal memory.

1. In the File menu, press the File Mgmnt submenu key. Double-tap on the Internal memory icon (Figure 8-3 on page 8-5).

2. Select the files and folders to delete. If desired, use the checkbox column header to select all the files in the current location or folder (Figure 8-22). Use the Navigation submenu buttons as needed to move through a long list of files.

3. Under File Mgmnt, select Delete.
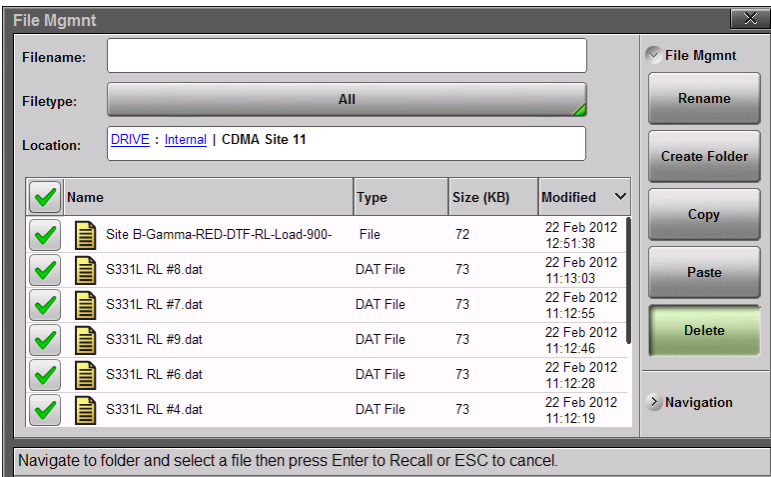
Figure 8-22. Selecting Multiple Items to Delete

Warning	Upon user confirmation in the next step, the Delete function will delete all selected files, including files not created by the Site Master. Use caution when deleting files.

4. To confirm that you want the files deleted, press Yes. Press No if you are unsure.

Confirm Multiple File Delete
55 file(s) and 7 folder(s) are selected. Are you sure you want to delete them?

Yes	No
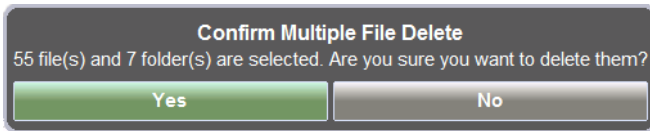
Figure 8-23. Confirm File Deletion

8-9   Create a Folder

The Site Master S331L allows folders to be created in either internal memory or an external USB drive. Multiple subfolders can also be created. This functionality is helpful in organizing traces by date, technician, carrier, and/or site location.

1. In the File menu, press the File Mgmnt submenu key.

2. Navigate to the location where you wish to create the new folder.

3. Press the Create Folder button.

4. Name the folder using the onscreen keyboard (Figure 8-24). Refer to "Choose the File Name" on page 8-7 for additional information.
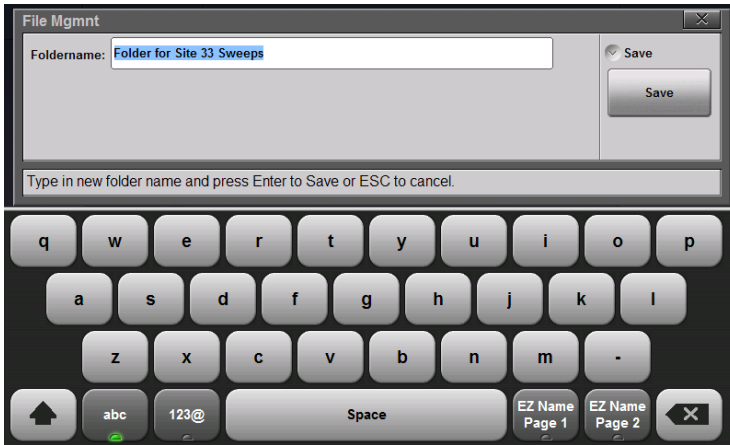
Figure 8-24. Name the Created Folder

5. Press Save or **Enter** to complete.
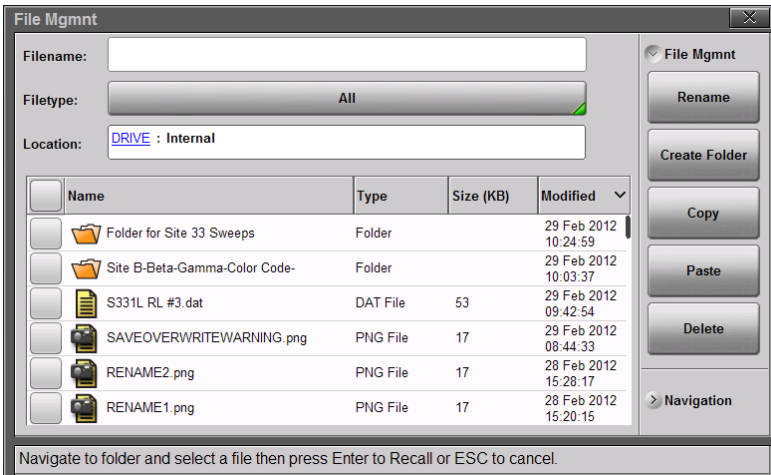
Figure 8-25. New Folder Created

Note	Creating a new folder does not also set the folder as the current save location (displayed in the bread crumb). Refer to "Set the Save Location" on page 8-3 for additional information.
	To keep the S331L optimized for file management operations, the instrument will give the user a warning if the number of files in a folder exceeds a certain amount. The user is advised to delete or move the files into different folders or external USB drives at that time.

8-10   File Menu Overview

Figure 8-26 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. The selectable file types are different in VIP Mode (see Figure 13-7 on page 13-8).
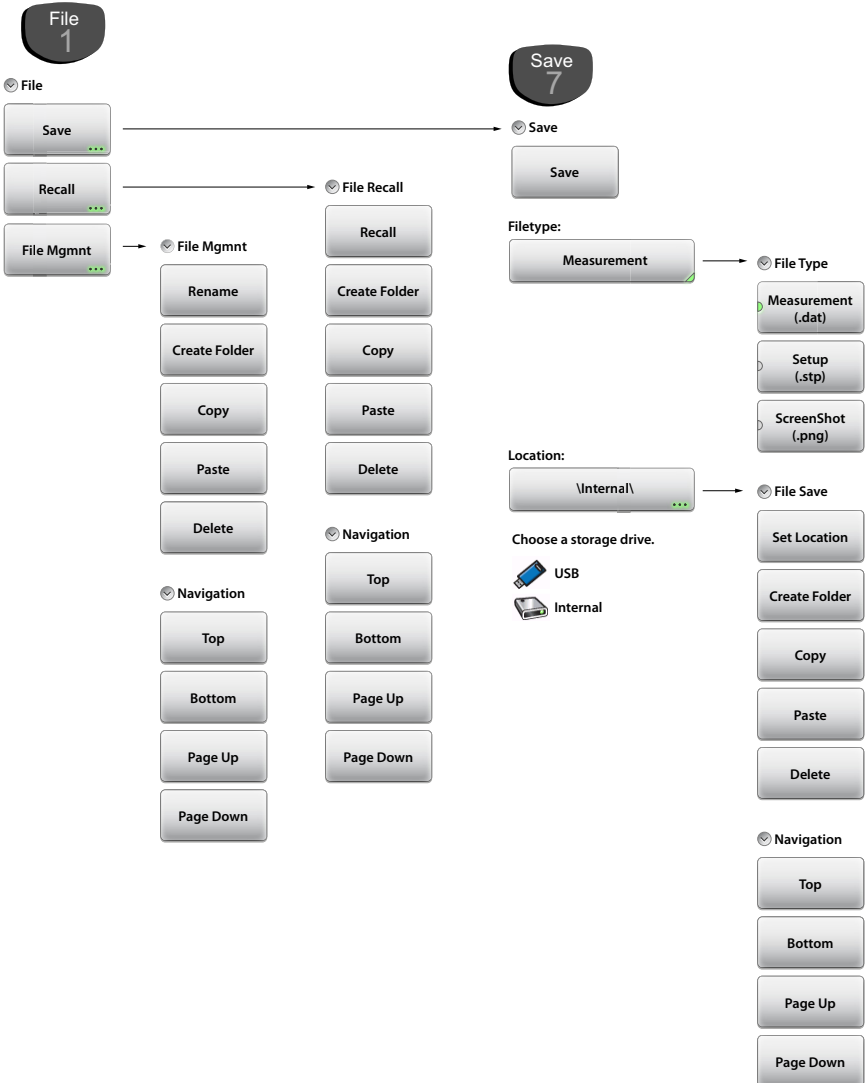
Figure 8-26. File Menu Keys

8-11   File Menu

Key Sequence: **File** (1)
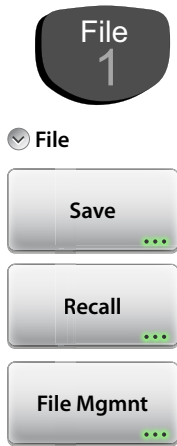
File 1 ⊘ **File** **Save** ... **Recall** ... **File Mgmnt** ...	**File:** **Save:** Press this submenu key to display the "Save Menu" on page 8-26 and the touch screen keyboard. Site Master files can be saved to internal memory or to a USB flash drive. The saved Measurement, Setup, or Screen shot file can be named by using the touch screen keyboard. By default, measurements are saved to internal memory. The save destination is set using "Set Location" on page 8-27. **Recall:** Press this submenu key to display the Recall submenu shown in Figure 8-9 on page 8-12. This menu is for recalling a measurement or setup data from internal memory or from a USB flash drive. The Recall function can also be used to preview saved Screen Shot Files. **File Mgmnt:** Press this submenu key to display the "File Mgmnt Menu" on page 8-30. This menu contains basic file management functions including renaming files or folders, creating folders, copying, pasting, and deleting files or folders. Many of the file management functions are duplicated in the Save and Recall menus for user convenience.

Figure 8-27. File Menu

Save Menu

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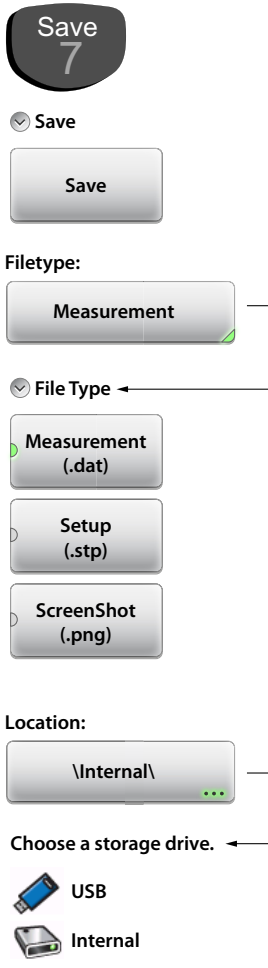
Save:

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

Filetype: Press this key to select the file format to save.

> **Measurement (.dat):** Measurement files contain the measurement data and setup data. They can be recalled and viewed on the instrument or viewed on a PC with Line Sweep Tools.

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

> **ScreenShot (.png):** Screen shot files contain a screen capture of the display. Capture settings are set in the "Display/Audio Menu" on page 9-19.

The selectable file types are different in Video Inspection Probe (VIP) mode. See Figure 13-7 on page 13-8.

Location: Displays the current save location. Press this key to change the location where the Site Master saves files. Select folders or drives with the arrow keys, the rotary knob, or the touchscreen. See Figure 8-25 on page 8-22.

Figure 8-28. Save Menu (1 of 2)

Location:

\Internal
...

Choose a storage drive.

USB

Internal

File Save

Set Location

Create Folder

Copy

Paste

Delete

Navigation

Top

Bottom

Page Up

Page Down

File Save:

Set Location: Press this submenu key to set the current location for saving files and then return to the "Save Menu" on page 8-26.

Create Folder: Press this submenu key to create a new folder in the highlighted location or folder. Name the new folder with the onscreen keyboard and press **Save**.

Copy: Press this submenu key to mark the selected files and/or folders for copying or moving, using the Paste command. Use the checkbox column to select multiple items to copy or move.

Paste: Press this submenu key to paste the selected files and/or folders to the destination location. In the message box that appears (see Figure 8-20 on page 8-19), press Paste to create duplicate copies in the destination folder; press Move 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, the Site Master will ask you to confirm that the existing files should be overwritten.

Delete: Press this submenu key to delete the files and/or folders that are selected. Only files or folders from one location can be deleted at a time. Use the checkbox column to select multiple items to delete.

Once an item is deleted, it cannot be recovered.

Navigation:

Top: Press this key to navigate to the top item of the current location.

Bottom: Press this key to navigate to the bottom item of the current location.

Page Up: Moves up one screen of items (7 rows) in the current location.

Page Down: Moves down one screen of items (7 rows) in the current location.

Recall Menu

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

⊙ **File Recall**	**File Recall:**
Recall	**Recall:** Press this submenu key to recall the selected file. Measurements, setups, or screen shots can be recalled.
Create Folder	Recalled measurements are first displayed on the Site Master 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 Files" on page 8-12 for additional information.
Copy	Recalled setups change the current setup including measurement type, frequency/distance, amplitude, marker, and limit data.
Paste	Recalled screen shots are previewed on the Site Master. Press **ESC** to return to the File Recall menu.
Delete	**Create Folder:** Press this submenu key to create a new folder in the highlighted location or folder. Name the new folder with the onscreen keyboard and press **Save**.
⊙ **Navigation**	**Copy:** Press this submenu key to mark the selected files and/or folders for copying or moving, using the Paste command. Use the checkbox column to select multiple items to copy or move.
Top	**Paste:** Press this submenu key to paste the selected files and/or folders to the destination location. In the message box that appears (see Figure 8-20 on page 8-19), press Paste to create duplicate copies in the destination folder; press Move 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, the Site Master will ask you to confirm that the existing files should be overwritten.
Bottom	
Page Up	
Page Down	

Figure 8-29. Recall Menu (1 of 2)

⊙ **File Recall**	**Delete:** Press this submenu key to delete the files and/or folders that are selected. Only files or folders from one location can be deleted at a time. Use the checkbox column to select multiple items to delete.
Recall	
	Once an item is deleted, it cannot be recovered.
Create Folder	
	Navigation:
Copy	**Top:** Press this key to navigate to the top item of the current location.
Paste	**Bottom:** Press this key to navigate to the bottom item of the current location.
	Page Up: Moves up one screen of items (7 rows) in the current location.
Delete	**Page Down:** Moves down one screen of items (7 rows) in the current location.
⊙ **Navigation**	
Top	
Bottom	
Page Up	
Page Down	

Figure 8-29. Recall Menu (2 of 2)

File Mgmnt Menu

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

⊙ **File Mgmnt** **Rename** **Create Folder** **Copy** **Paste** **Delete** ⊙ **Navigation** **Top** **Bottom** **Page Up** **Page Down**	**File Mgmnt:** **Rename:** Press this submenu key to rename a selected file or folder. The current name is displayed for editing or appending. Press Save or **Enter** to complete. **Create Folder:** Press this submenu key to create a new folder in the highlighted location or folder. Name the new folder with the onscreen keyboard and press **Save**. **Copy:** Press this submenu key to mark the selected files and/or folders for copying or moving, using the Paste command. Use the checkbox column to select multiple items to copy or move. **Paste:** Press this submenu key to paste the selected files and/or folders to the destination location. In the message box that appears (see Figure 8-20 on page 8-19), press Paste to create duplicate copies in the destination folder; press Move 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, the Site Master will ask you to confirm that the existing files should be overwritten. **Delete:** Press this submenu key to delete the files and/or folders that are selected. Only files or folders from one location can be deleted at a time. Use the checkbox column to select multiple items to delete. Once an item is deleted, it cannot be recovered. **Navigation:** **Top:** Press this key to navigate to the top item of the current location. **Bottom:** Press this key to navigate to the bottom item of the current location. **Page Up:** Moves up one screen of items (7 rows) in the current location. **Page Down:** Moves down one screen of items (7 rows) in the current location.

Figure 8-30. File Mgmnt Menu

Chapter 9 — System Operations

9-1   Introduction

This chapter will review various instrument management features of the Site Master. This will include:

| Note	The **Save** menu and **File** menu are discussed in Chapter 8. The other keyboard menu keys are measurement mode specific and discussed in Chapter 3, "Cable and Antenna Measurements" or Chapter 5, "Internal Power Meter".

9-2   Self Test

At power on, the Site Master runs through a series of checks to ensure that the system is functioning properly.

If the Site Master is within the temperature operating range with a charged battery, and fails the self test, contact your Anritsu Service Center (http://www.anritsu.com/contact-us).

To start a self test when the system is already powered up:

   1. Press the **System** (8) key.

   2. Press the Diagnostics submenu, then Self Test. The test will start and the results are displayed in the dialog box (see Figure 9-1).

3. Use the **Up/Down** arrow keys, rotary knob or on screen navigation keys to move through the test results.

4. Pressing Save to File will automatically create a text file of the test results. The file is saved to internal memory and labeled `S331LSelfTest#X.txt`. The .txt file can be copied to a USB memory device and viewed on a PC with a text reader or word processor.
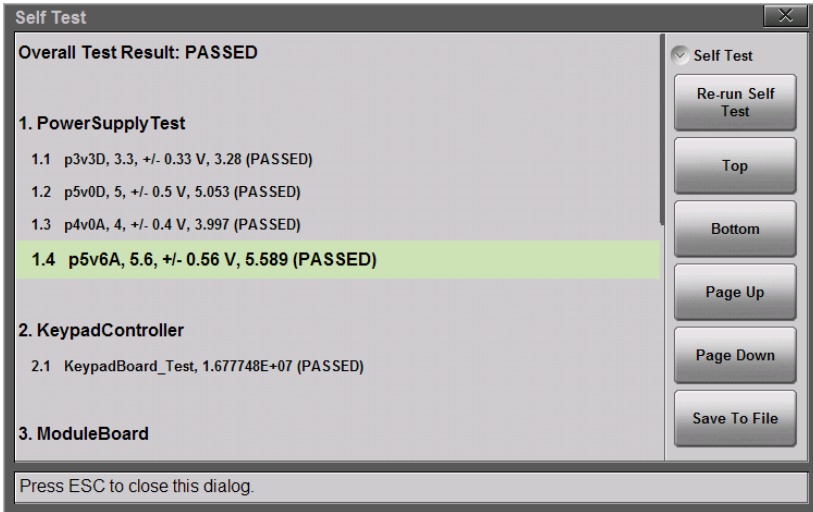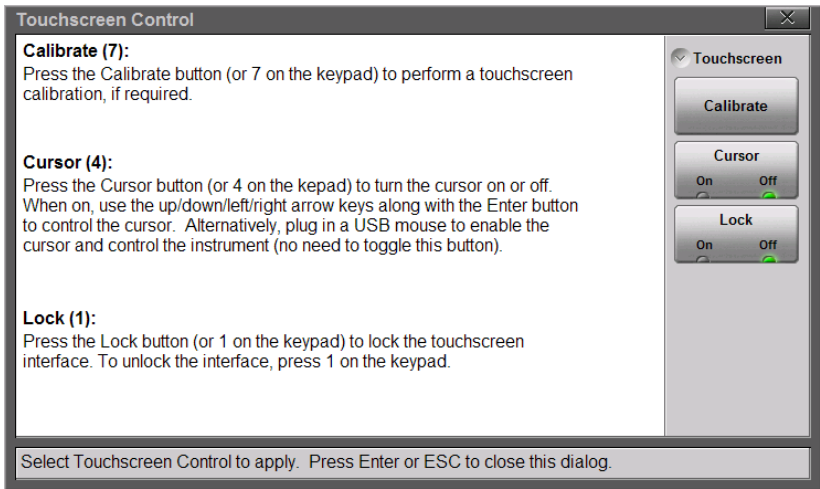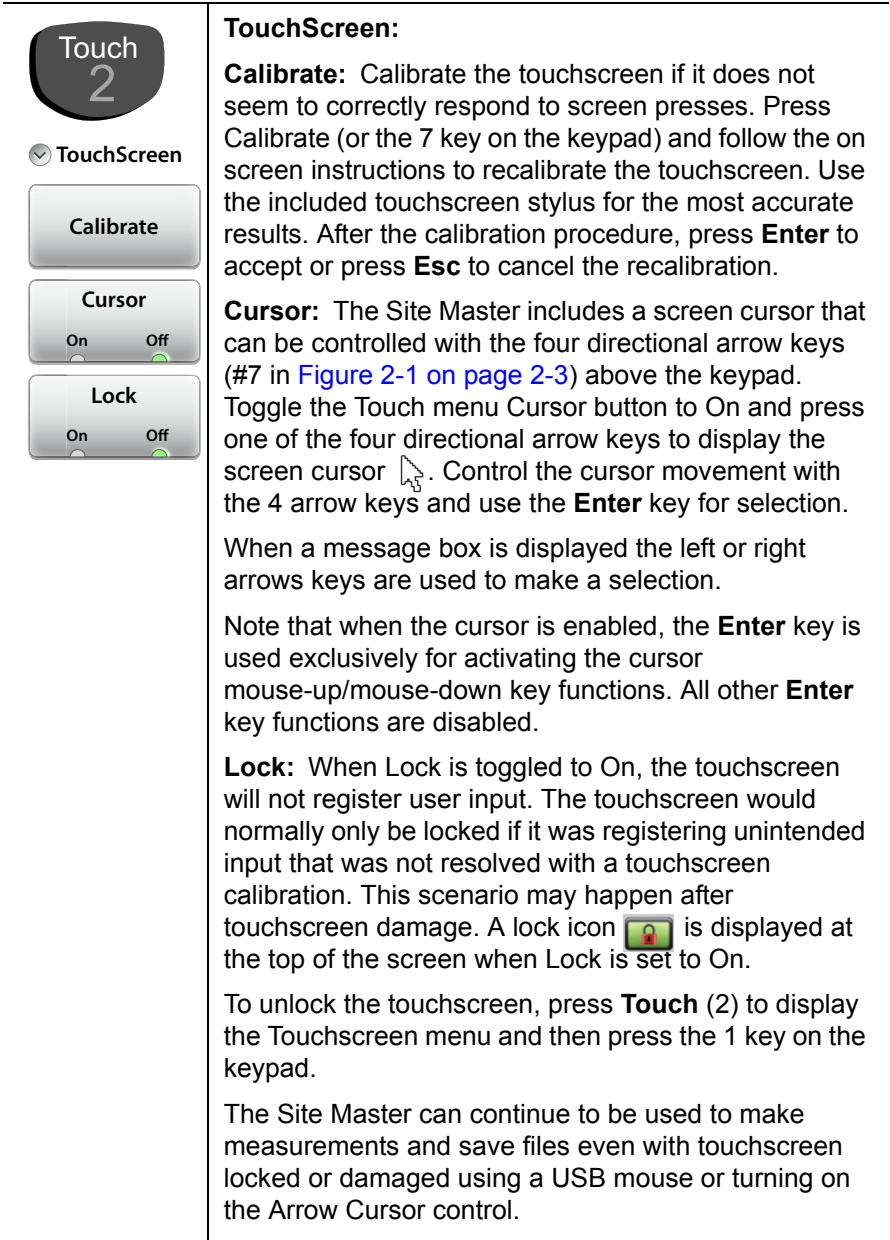

Figure 9-1.   Site Master Self Test

9-3   Touch Menu

Key Sequence: **Touch** (2)

The touch menu includes touchscreen calibration, an on screen cursor option moved by the arrow keys, and the ability to lock out the touchscreen. Refer to the instructions shown in Figure 9-2 and the additional details provided in Figure 9-3 on page 9-4.

Figure 9-2.   Touchscreen Control

TouchScreen:

Calibrate: Calibrate the touchscreen if it does not seem to correctly respond to screen presses. Press Calibrate (or the 7 key on the keypad) and follow the on screen instructions to recalibrate the touchscreen. Use the included touchscreen stylus for the most accurate results. After the calibration procedure, press **Enter** to accept or press **Esc** to cancel the recalibration.

Cursor: The Site Master includes a screen cursor that can be controlled with the four directional arrow keys (#7 in Figure 2-1 on page 2-3) above the keypad. Toggle the Touch menu Cursor button to On and press one of the four directional arrow keys to display the screen cursor . Control the cursor movement with the 4 arrow keys and use the **Enter** key for selection.

When a message box is displayed the left or right arrows keys are used to make a selection.

Note that when the cursor is enabled, the **Enter** key is used exclusively for activating the cursor mouse-up/mouse-down key functions. All other **Enter** key functions are disabled.

Lock: When Lock is toggled to On, the touchscreen will not register user input. The touchscreen would normally only be locked if it was registering unintended input that was not resolved with a touchscreen calibration. This scenario may happen after touchscreen damage. A lock icon is displayed at the top of the screen when Lock is set to On.

To unlock the touchscreen, press **Touch** (2) to display the Touchscreen menu and then press the 1 key on the keypad.

The Site Master can continue to be used to make measurements and save files even with touchscreen locked or damaged using a USB mouse or turning on the Arrow Cursor control.

Figure 9-3.   Touch Menu

9-4 Help Menu

Key Sequence: **Help** (0)

Displays options to view information about the instrument status, Site Master Frequently Asked Questions (FAQ) or the instrument's User Guide (see Figure 9-4).
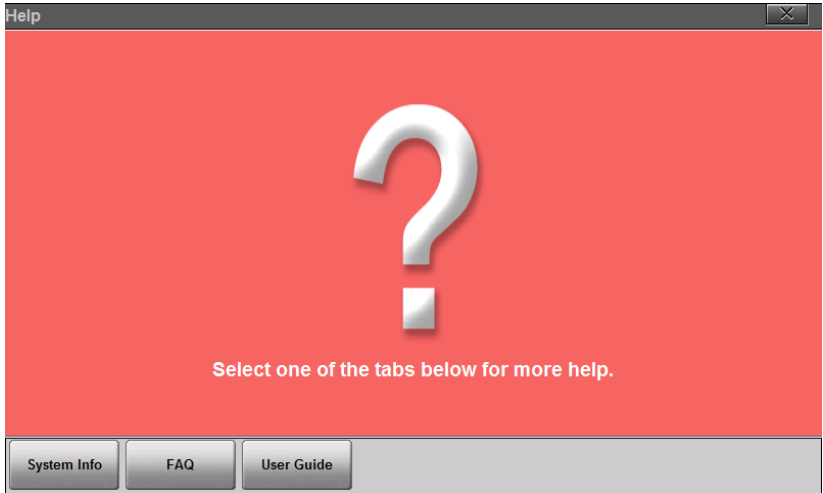
Figure 9-4. Main Help Menu Screen

Press the System Info button to display information about the current status (see Figure 9-5).

Figure 9-5.   System Info

Note that Main Board Temp is displayed in the Hardware Info column. Package Version (in the Software Info column) is the current firmware version.

Press **Esc** or [X] to close and return to the main help menu screen. Press **Esc** or [X] a second time to exit the help menu.

From the main help screen, press the **FAQ** button to display answers to frequently asked questions including the difference between Classic and Advanced Cable & Antenna Analyzer modes (see Figure 9-6).

Scroll through the .html files using the touchscreen navigation aids on the top and bottom of each screen.
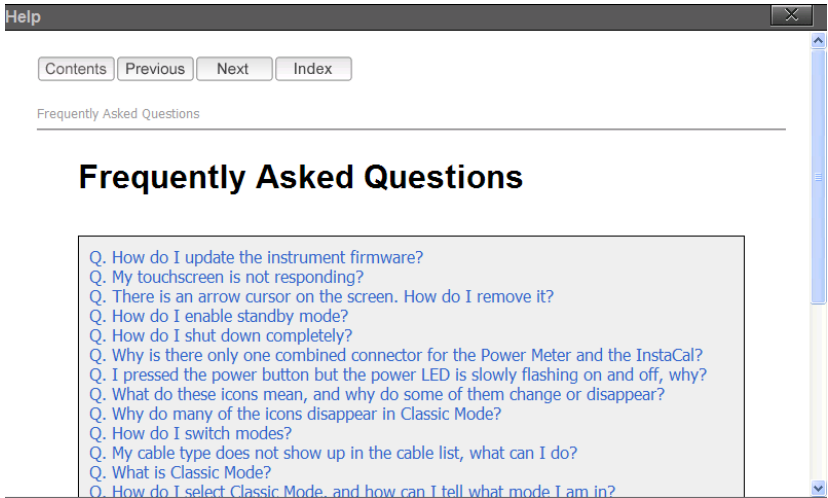
Figure 9-6.   FAQ File

Press **ESC** or [X] to close and return to the main help menu screen. Press **ESC** or [X] a second time to exit the help menu.

Note	The S331L Site Master arrow keys can be used to navigate through previously viewed screens. The left arrow key (◁) functions as the browser Back button and displays the screen viewed immediately before the current screen. Pressing the left arrow key more than once continues to move back to display previously viewed screens. The right arrow key (▷) functions as the browser Forward button. Pressing it (after having pressed the left arrow key) returns the display towards the current screen.

From the main help screen, press the User Guide button to display the instrument's User Guide onscreen (see Figure 9-7).

Figure 9-7.   User Guide

Each page in the User Guide displays navigation buttons and bread crumbs. Links to the TOC and a compiled index are also available.

Press **ESC** or [X] to close and return to the main help menu screen. Press **ESC** or [X] a second time to exit the help menu.
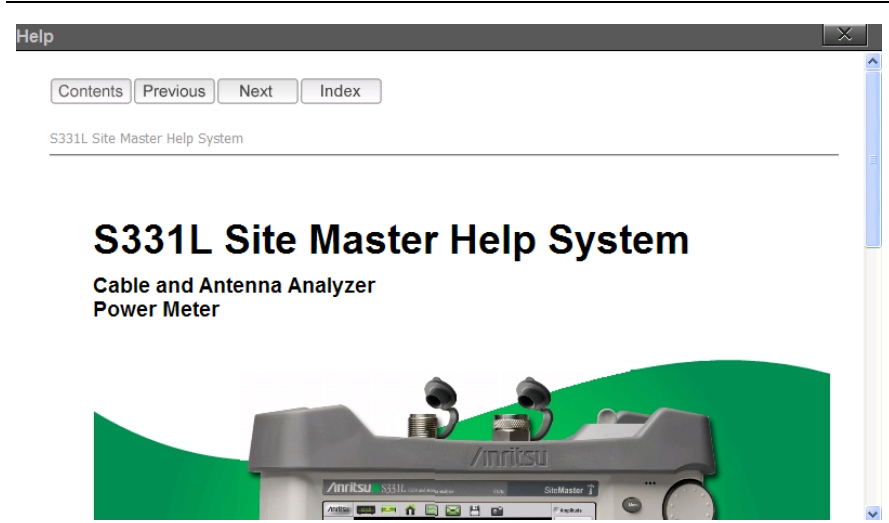
9-5   Updating the Site Master Firmware

The Site Master firmware is updated using a customer supplied USB memory stick. The firmware update is downloaded from the Anritsu web site.

Note	Press the Anritsu logo in the upper-left corner of the screen to display instrument status. Press SW Info button to view the current software revision.

Updated product information can be found on the Anritsu web site:

http://www.anritsu.com/

Search for the product model number. The firmware updates are on the product page under the Library tab in the "Drivers, Software Downloads" section.

Note	The "Release History" link provides a summary of the firmware changes.

1. Click on the "Firmware Update for the Site Master S331L" link.

2. Click the "Download" button and then "Run". After the download is complete, press "Run" again and follow the onscreen instructions.

   Press "Help (?)" for additional information.

3. After the firmware update is saved on the USB memory stick, remove the memory stick from the computer.

4. Turn off the Site Master and insert the USB memory stick into the USB port.

5. Connect the AC adapter and turn the Site Master on.

6. Press the **Preset** (9) key.

7. Under the Reset submenu, press Update Firmware. The Update Firmware dialog (Figure 9-8) appears.
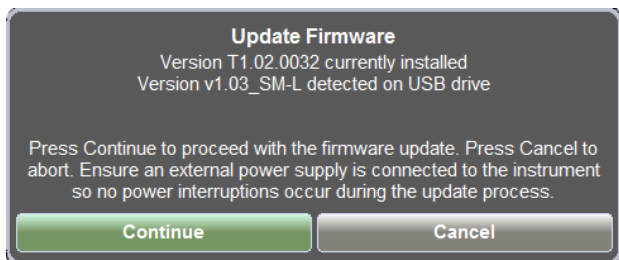
Figure 9-8.   Update Firmware Message

8. Select CONTINUE to begin the firmware update or CANCEL to cancel.

9. After the update is complete, the instrument will power down. Restart the instrument to complete the update.

10. Software version information is displayed in the System Status dialog box. See Figure 9-5 on page 9-6.

Warning	Do not remove power or turn off the instrument during the firmware update to avoid potential serious damage to the instrument.

9-6   Screen Shot Capture

The Site Master can capture a bit mapped image of the display in
Portable Network Graphics (.png) format using the **ScrnShot** (4) key or
the Camera icon, 　　.

The file is automatically named based on the instrument model and
measurement type. Screen shot files are saved to the instrument's
internal memory in the ScrnShots folder (Drive : Internal | ScrnShots).

The look of the saved screen shot is set in this location: **System** (8) >
System Setups > Display/Audio > ScrnShot Settings. Refer to the
"Display/Audio Menu" on page 9-19 for details. Figure 9-9 on page 9-12
is an example of the same measurement saved with different screen
shot settings.

Note	Measurements can also be saved as screen shots using the **Save** (7) menu, and then, setting the Filetype to ScreenShot. Using the **Save** menu allows the file name and location to be set by the user. Refer to Chapter 8 for additional information.
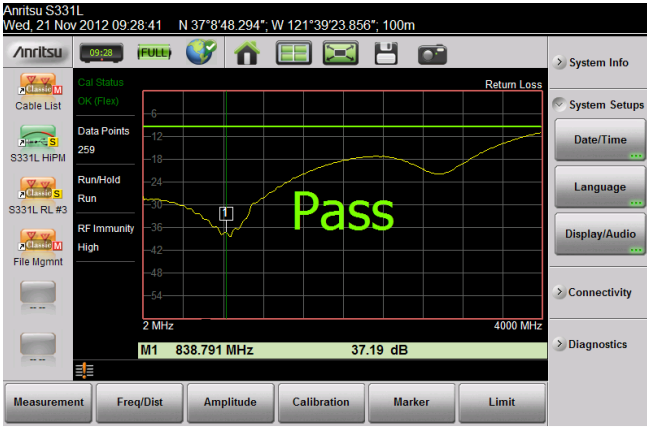
Settings:
Image Capture Size: Full Screen
Background Color: Standard
Image header/footer: Header
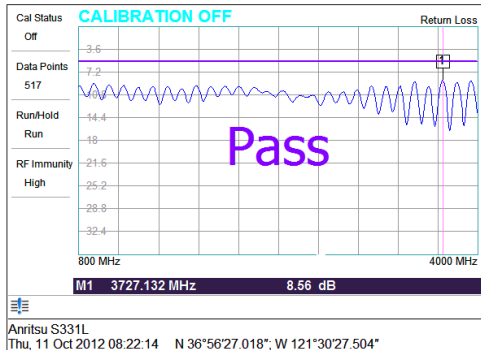
Settings:
Image Capture Size: Graph Only
Background Color: Inverted
Image header/footer: Footer

Figure 9-9.   Screen Shot Settings

9-7   System Menu Overview

Figure 9-10 shows the map of the System menus and submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.
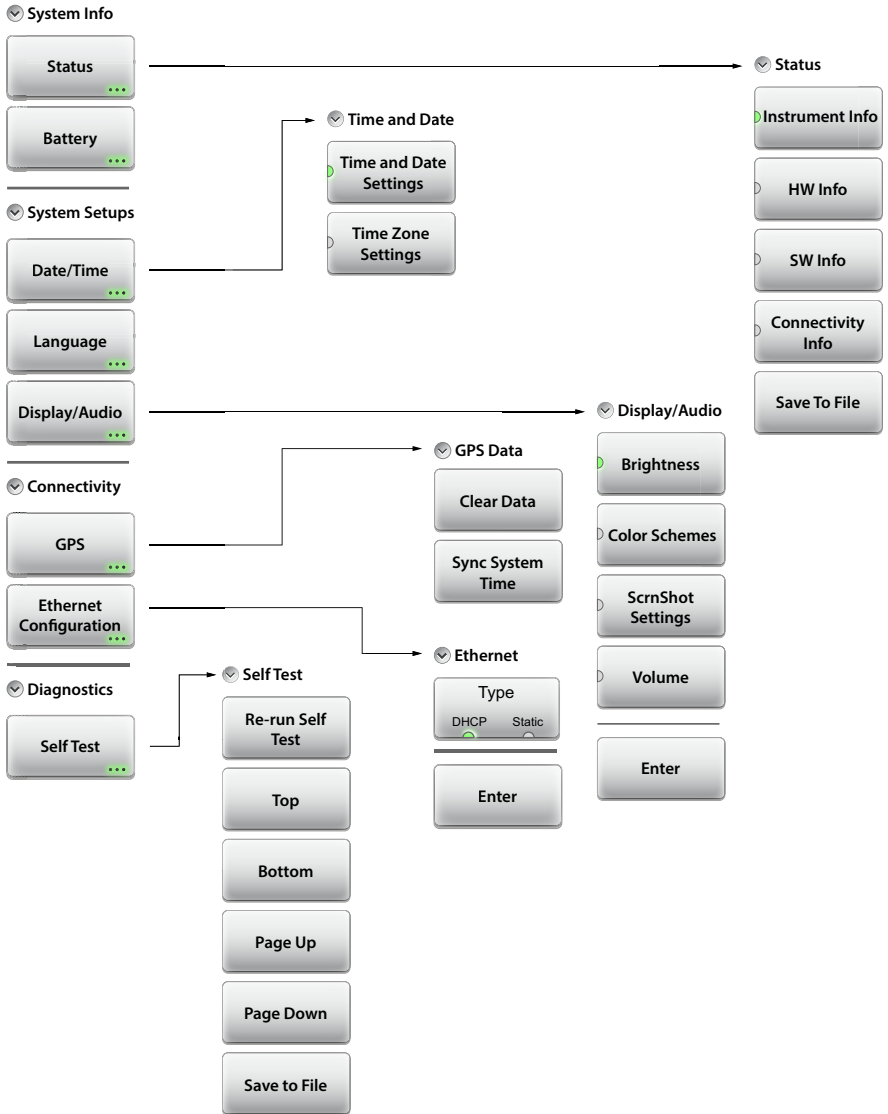
Figure 9-10. System Menu Keys

9-8   System Menu

Key Sequence: **System** (8)

System Info:

Status: Press this submenu key to display the "Status Menu" on page 9-16, which includes detailed instrument, hardware, software and connectivity information.

Battery: Press this key to display the battery charge remaining and charge status.

System Setups:

Date/Time: Press to display the "Time and Date Menu" on page 9-17.

Language: Press to set the default language. Options include: English, French, German, Italian, Spanish, Russian, Portuguese, Japanese, Korean, or Chinese.

Display/Audio: Press this submenu key to access the "Display/Audio Menu" on page 9-19, which includes display, screen shot, and volume settings.

Connectivity:

GPS: Press to display the "GPS Menu" on page 9-21.

Ethernet Configuration: Press this submenu key to display the "Ethernet Configuration Menu" on page 9-23, which shows the IP Address and MAC Address of the instrument and allows you to choose the setting for obtaining the IP Address (DHCP or Static).

Figure 9-11.   System Menu (1 of 2)

	Diagnostics:
⌄ **Diagnostics** **Self Test** ...	**Self Test:** Press this submenu key to initiate a series of diagnostic tests that check the components of the instrument. A display lists the individual tests with a pass or fail indication (Figure 9-1 on page 9-2). Press **Esc** to close the dialog box.
	Press Save to File to create a text file of the test results. The file is saved to internal memory and labeled `S331LSelfTest#X.txt`. The `.txt` file can be copied to a USB memory device and viewed on a PC with a text reader or word processor.

Figure 9-11. System Menu (2 of 2)

Status Menu

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

⊘ **Status**	**Status:**
▷ **Instrument Info**	**Instrument Info:** Displays the instrument model, installed options, serial number, instrument name, hours of operation, and the number of power cycles.
▷ **HW Info**	**HW Info:** Displays information on main board temperature (internal temperature), module board temperature, remaining battery charge, system voltage, and ID information for various components.
▷ **SW Info**	**SW Info:** Press this submenu key to display the version of various software components.
▷ **Connectivity Info**	**Connectivity Info:** Press this submenu key to display the Ethernet IP Address and MAC address of the instrument.
Save To File	**Save to File:** Press Save to File to create a text file of the instrument status. The file is saved to internal memory and labeled S331LStatus#X.txt. The .txt file can be copied to a USB memory device and viewed on a PC with a text reader or word processor.

Figure 9-12. Status Menu

Figure 9-13. System Status Dialog Box

Time and Date Menu

Key Sequence: **System** (8) > System Setups > Date/Time

Time and Date:

Time and Date Setting: Press to change the current time and/or date using the touchscreen or the numeric keypad. Press **Enter** to save the changes. See Figure 9-15.

With a good fix, the system date and time can be updated from the GPS signal. Refer to "GPS Menu" on page 9-21.

Time Zone Settings: Press to change the time zone and to select whether the system clock is automatically adjusted for daylight saving time. Press **Enter** to save the changes.

Figure 9-14. Time and Date Menu
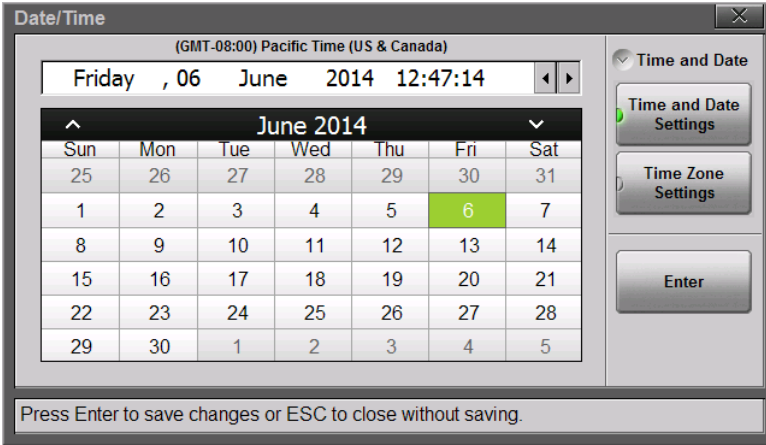
Figure 9-15. Date/Time Dialog Box

Display/Audio Menu

Key Sequence: **System** (8) > System Setups > Display/Audio
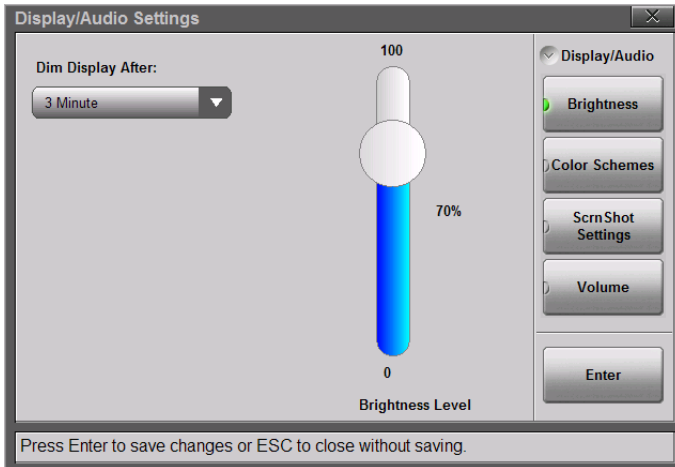
Figure 9-16. Display Brightness Dialog Box

Brightness: Press this key to access the display brightness settings. See Figure 9-16. You can adjust the level for a wide variety of lighting conditions.

Use the touchscreen, the **Up/Down** arrow keys, or the rotary knob to adjust the currently active setting. Press **Enter** to save the change or **Esc** to cancel.

Display Auto-dimming is enabled by default (1 minute) to extend battery life. Tap the Dim Display After bar to display the available drop-down selections for Auto-dimming. You can choose to dim after a number of minutes (from 1, 2, 3, 5, 10, or 15) or choose Never. The default dim level is fixed at 3 minutes.

Figure 9-17. Display/Audio Menu (1 of 2)

⊙ **Display/Audio** **Brightness** ▷ **Color Schemes** ▷ **ScrnShot Settings** ▷ **Volume** ―――――― **Enter**	**Color Schemes:** Press this key and use the touchscreen to select Standard, Daytime, or Nighttime color scheme. Daytime increases the contrast of the display and is useful outdoors in bright light or other challenging viewing conditions. Nighttime sets the display to a darker red-tinted color scheme, useful in night-time viewing conditions. **ScrnShot Settings:** Press to change the settings used when capturing a screen shot with the ScrnShot (4) key, the ▢ icon, or when saving a screen shot (.png) file. See Figure 9-9 on page 9-12. Under Image Capture Size, select Graph Only, or select Full Screen to capture the entire display screen including menu buttons. Under Background Color, select Inverted to remove the graph background color (useful for paper printing) or Standard for the typical black background. Use Image Header/Footer to select the location where the instrument model, name, and date stamp are displayed. **Volume:** Press this submenu key to adjust the volume. The current volume setting is displayed. Use the touchscreen, the **Up/Down** arrow keys, or the rotary knob to change the volume and press the **Enter** key to accept the change. **Enter:** Press this key or the **Enter** key to apply changes set in the other Display/Audio submenus.

Figure 9-17. Display/Audio Menu (2 of 2)

GPS Menu

To use GPS, you must have an external USB-based GPS module connected.

Key Sequence: **System** (8) > Connectivity > GPS

⊘ **GPS Data** **Clear Data** **Sync System Time**	**Clear Data:** Press this key to clear the Site Master's current GPS location data or last known GPS location data. If the 2000-1723-R or compatible GPS module is attached, the instrument will attempt to re-acquire a GPS fix. Note: The last Good Fix location information will be retained until the instrument is powered off, the Clear Data button is pressed, or a new Good Fix is acquired. The Good Fix or the Last Fix location information is stored in the measurement file and is included in the screen capture header/footer. **Sync System Time:** Press this key to sync the instrument's time setting with the current GPS information. Sync only works with a good GPS fix. After a valid sync, the instrument time is reset based on the UTC time plus/minus the time zone offset. Refer to "Time Zone Settings" on page 9-17.

Figure 9-18. GPS Menu

Figure 9-19. GPS Info

Note	An exclamation mark (!) is appended to the GPS location data in screen captures when the instrument is using Last Fix instead of current GPS information.
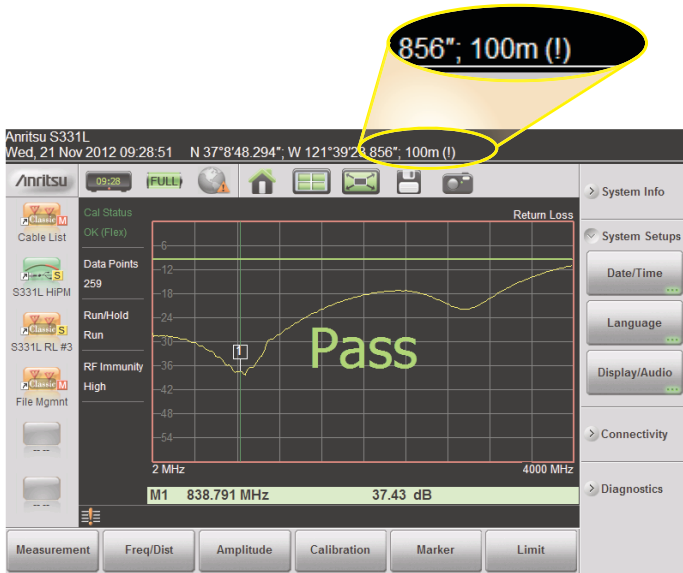
Figure 9-20. (!) Indicates Last Fix GPS Data

Ethernet Configuration Menu

Key Sequence: **System** (**8**) > Connectivity > Ethernet Configuration

	Ethernet
⊙ **Ethernet** **Type** DHCP Static ◯ ◯ **Enter**	**Type:** Press this key to select the type of IP Address setting: DHCP or Static. When set to DHCP, the instrument dynamically sets the IP Address and displays it, as shown in Figure 9-22. When set to Static, the user must manually enter the IP, Gateway, and Subnet addresses, as shown in Figure 9-23. The settings are saved once the Enter button is pressed.

Figure 9-21. Ethernet Configuration Menu
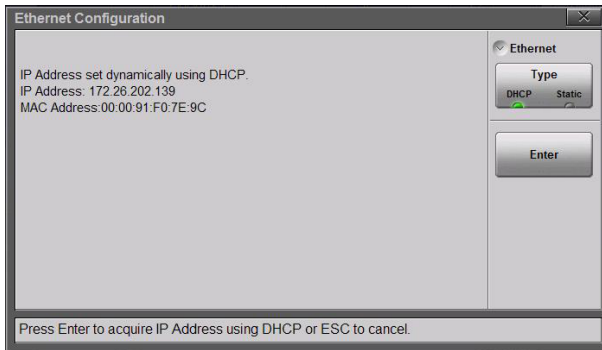
Figure 9-22. Ethernet Configuration Dialog - DHCP
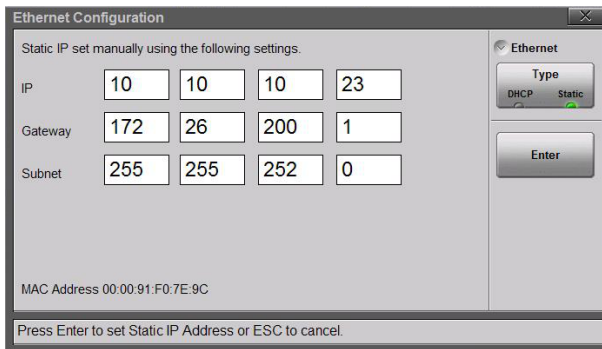
Figure 9-23. Ethernet Configuration Dialog - Static

9-9 Preset Menu

Key Sequence: **Preset** (9)

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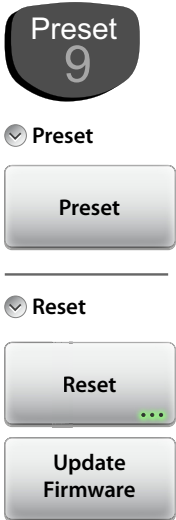
Preset:

Preset: Press this key to reset the instrument to the default conditions.

Preset condition in Cable & Antenna mode: Return Loss measurement, full frequency range, full amplitude scale, no calibration, all markers off, and limit line off.

Reset:

Reset: Press this key to display the reset options shown below. Select the Reset option to apply using the touchscreen, **Up/Down** arrow keys or rotary knob. Carefully read the on screen information before confirming the reset.

Factory Reset: Press this key to restore the instrument to the factory default values, including language, volume, display/audio settings. User saved files and user created shortcut icons on the Menu screen are not deleted.

Press the Factory Reset button to initiate the reset, and power cycle the instrument. Press **ESC** to cancel and close.

Delete All User Files: Deletes all user files in Site Master internal memory including measurements, setup files, and screen shots. Menu shortcuts, customized EZ key names, and custom cable types are not deleted.

To delete all user files, press the Delete All User Files button and then, press Yes to confirm.

Figure 9-24. Preset Menu (1 of 2)

Preset
9

⊙ **Preset**

Preset

⊙ **Reset**

Reset
...

**Update
Firmware**

Delete Custom Files: Select the custom files to delete including keyboard EZ names, menu shortcuts, and custom cable types (Figure 9-25 on page 9-26).

Use the touchscreen to select the custom file types to delete and press the Delete Custom Files button and then press Yes to confirm.

Master Reset: In addition to the functions described in Factory Reset above, all user files in the internal memory and all custom files are deleted (Figure 9-26 on page 9-27).

Press the Master Reset button to initiate the Master Reset and then press Yes to confirm.

Update Firmware: Press this submenu key to update the instrument operating system with a USB flash drive. Follow the on screen instructions to update the firmware. Refer to Section 9-5 "Updating the Site Master Firmware" on page 9-9 for additional information.

Figure 9-24. Preset Menu (2 of 2)
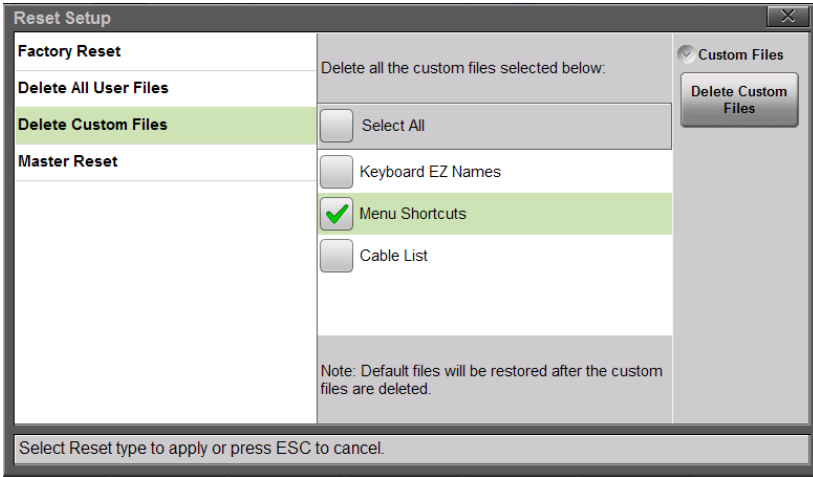
Figure 9-25. Delete Custom Files

Note	If the Site Master is not functioning as expected, perform a preset. All the current settings and applied calibration factors will be cleared. The next step if a preset does not resolve the issue is a Factory Reset. This can be performed at power on by holding down the **ESC** key and pressing the power button, or through the **Preset** (9) menu.
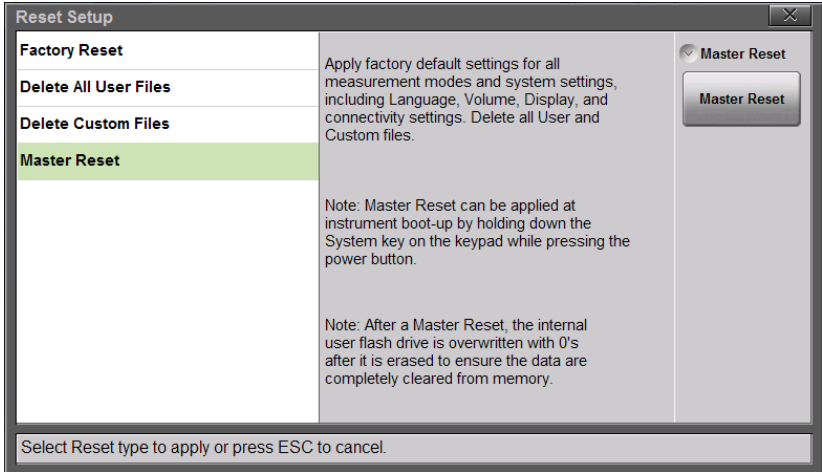
Figure 9-26. Master Reset

Chapter 10 — Battery Replacement

10-1 Introduction

This chapter provides details and procedures about the Site Master batteries including replacing the existing batteries.

10-2 Site Master Battery

The batteries that are supplied with the Site Master may need charging before use. The batteries can be charged using either the AC-DC Adapter (40-187-R) or the DC adapter (806-141-R). Refer to Figure 2-7 on page 2-17 for a description of battery symbols.

Note	Use only Anritsu Company approved batteries, adapters, and chargers with this instrument.

The batteries are charged in the instrument and only removed for replacement.

Pressing the battery icon ![battery icon] will display the current battery information (Figure 10-1). Press **ESC** to clear the message.
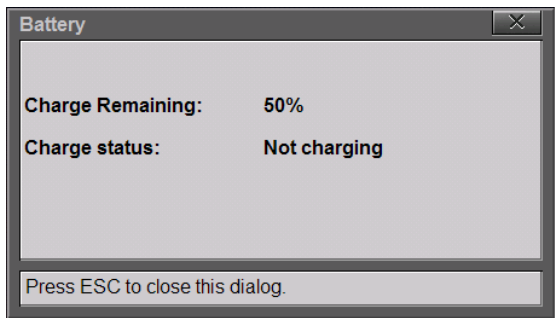
Figure 10-1. Battery Information

10-3   Battery Replacement

The Site Master batteries are installed at the factory and can be replaced by the user.

1. Power off the Site Master and remove the bottom bumper to expose the battery cover plate.

2. Set the unit face up on a secure surface and remove the six (6) screws holding the battery cover plate (Figure 10-2). Remove the cover plate and note the orientation for reassembly.

Figure 10-2. Remove the Battery Cover Plate

3. Carefully disconnect the battery connector and remove the battery. Repeat for the second battery (Figure 10-3).

Figure 10-3. Replacing the Batteries

4. Slide the new batteries into the two battery bays and carefully plug in the battery connectors.(Figure 10-4).
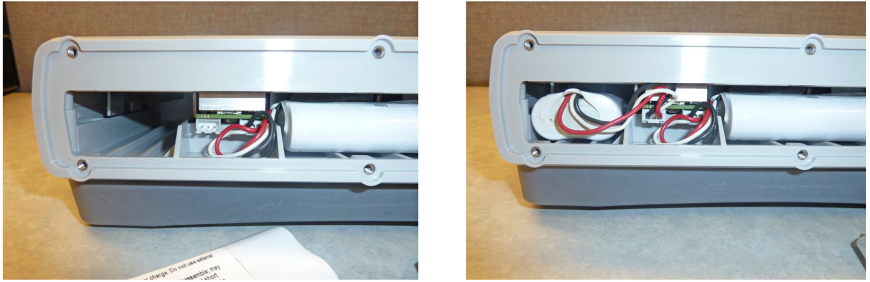
Figure 10-4. Adding the Second Battery

5. Reattach the battery cover plate with the 6 six screws and put the bottom bumper back on the Site Master.

Chapter 11 — Anritsu Tool Box with LST

11-1 Introduction

This chapter provides a brief overview of the Anritsu Tool Box and the Line Sweep Tools (LST) program. For detailed information about Line Sweep Tools, refer to the program Help.

11-2 Anritsu Tool Box

The Anritsu Tool Box is a central location to open an Anritsu measurement, visit the Anritsu web site, or launch an Anritsu application. The Tool Box contains software tools including a Line Sweep Tools program and other PC Tools for Anritsu Handheld RF Instruments.

The Tool Box installer is provided on the software disc and is also available for download from the Anritsu web site at:

http://www.anritsu.com/en-US/Services-Support/Handheld-Tools-Tool-Box.aspx

11-3   Install the Software

Run the Tool Box installer from the Installation disc or from the Downloads folder if you just performed the download, and follow the on-screen instructions (Figure 11-1). The screens shown below are for illustration purposes only and may change with the installer version.
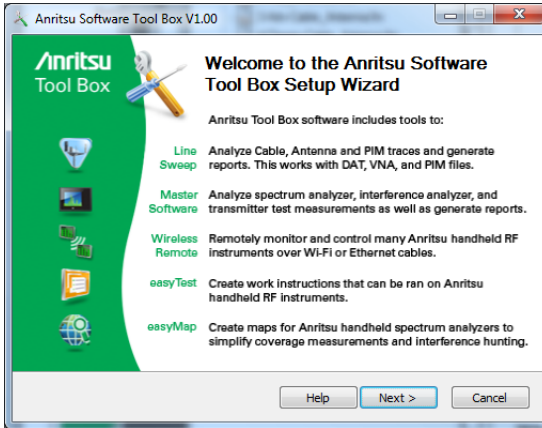
Figure 11-1.   Anritsu Software Tool Box Setup Wizard

The Setup Wizard lets you choose which software Tool Box component to install. By default, all available Tool Box applications are selected. See Figure 11-2.
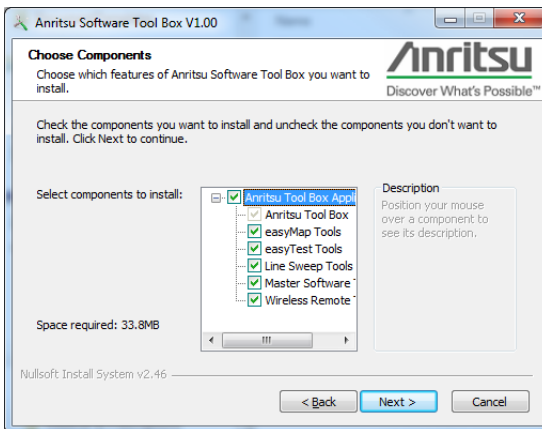
Figure 11-2.   Select Tool Box Components to Install

After the Anritsu Tool Box has been installed on the PC, either click on the shortcut icon on the desktop or click Start and navigate through the Programs folder to the Anritsu folder. Then click on the Anritsu Tool Box shortcut to open the Anritsu Tool Box. Once the Tool Box is open, move the mouse pointer over any of the application icons to view a short description of the application.

11-4   Line Sweep Tools

Line Sweep Tools is a program designed to increase productivity for people who work with dozens of Cable traces, Antenna traces, and Passive Intermodulation (PIM) traces every day.

Why use Line Sweep Tools?

Line Sweep Tools will:

- Collect sweeps from Anritsu PIM and Line Sweep gear.
- Help verify that those sweeps are done properly and that the Cable, Antenna and PIM sweeps meet specifications.
- Help create reports of the findings quickly and to a professional standard.

Line Sweep Tools Features

The Line Sweep Tools user interface is familiar to users of Hand Held Software Tools, the current industry standard line sweep post-capture trace processing software. This leads to a short learning curve and easy trace collection, validation, and reporting.

Anritsu's Line Sweep Tools program includes:

- Presets for markers and limit lines take hours off the report preparation time for a user with dozens of traces to verify.
- The Report Generator which makes generating PDF reports for multiple traces, with logos, quick and easy.
- Dual Trace viewing mode ensures compatibility with the E series line sweep instruments.
- A naming grid makes naming files, titles, and subtitles much quicker and error free.
- Line Sweep Tools can open DAT or VNA files from a wide range of current and supported Anritsu hand-held instruments.

- Line Sweep Tools can open the PIM files generated by Passive Inter-Modulation measurements.

Using Line Sweep Tools

Like its predecessor, Hand Held Software Tools (HHST), Line Sweep Tools is intuitive for most users. However, unlike HHST, Line Sweep Tools has the capability to work rapidly with a large number of traces.
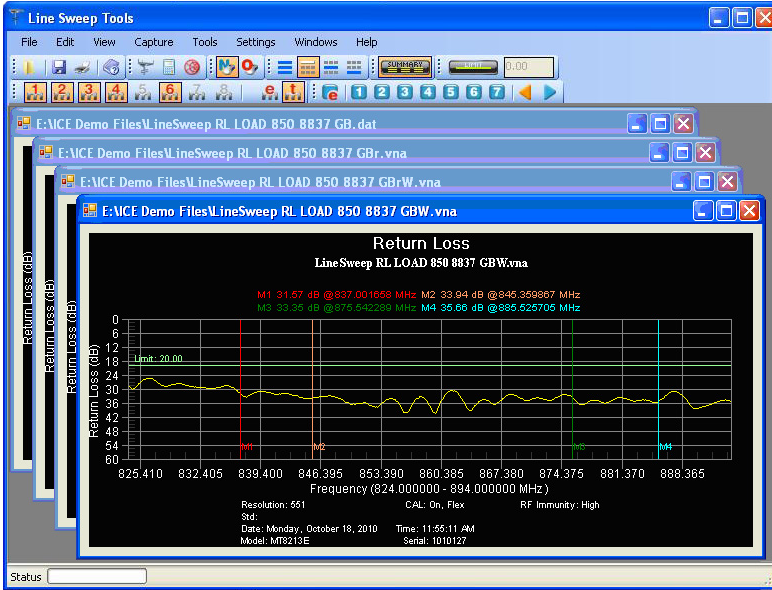
Figure 11-3. Line Sweep Tools Window

Line Sweep Tools can open DAT files from HHST; or VNA/DAT files from Anritsu's instruments. It also can open PIM files. Either way, the file once opened, can be inspected and modified in many different ways. Line Sweep Tools saves files as a new type of DAT file, and can export traces as VNA, text, JPG, BMP, or PNG. Line Sweep Tools produces files that can be opened by HHST.

Note	Power meter mode (.pm files) are not supported by LST.

Markers and Limit Lines

The easiest way to manage markers is to turn one on and use the mouse to drag it to the desired position. The marker tool bar is shown in Figure 11-4. Markers number 2 and 8 are On in the figure below. Markers can be set to an exact value by pressing the "**e**" button, which displays detailed marker controls, numeric value entry, peak find, and valley find.

Figure 11-4. Marker and Limit Tool Bar Tool Bar

The dark button on the right turns on the limit line. Once on, it can be dragged to the desired location, or placed at an exact amplitude value by entering a number.

Marker Presets

The fastest way to manage markers on multiple traces is to use the preset function. The marker and limit line preset tool bar allows users to quickly set all markers and the limit line to pre-defined values on similar traces (Figure 11-5).

Figure 11-5. Preset Tool Bar

First set the markers and limit lines on a typical trace to the desired values. Then, press the red "**e**" or edit button on the Preset Tool Bar. This puts the preset buttons into "learn" mode. Now, press a preset button (1 to 7). This programs the preset button where to put the markers and limit lines. Finally, press the red "**e**" button again to exit the learn mode.

The programmed button is now enabled. Line Sweep Tools can program up to 7 buttons with preset markers and limit line.

To use the preset, just press it and the markers and limit line will display at the programmed locations even when switching to a new trace. The two arrow keys make going to the next, or previous, trace simple. Using presets, a dozen similar traces can be reliably validated in seconds.

Naming Grid

The naming grid allows users to quickly and consistently name files, trace titles, and trace subtitles. The grid can be set up with custom phrases to make the naming process simpler.
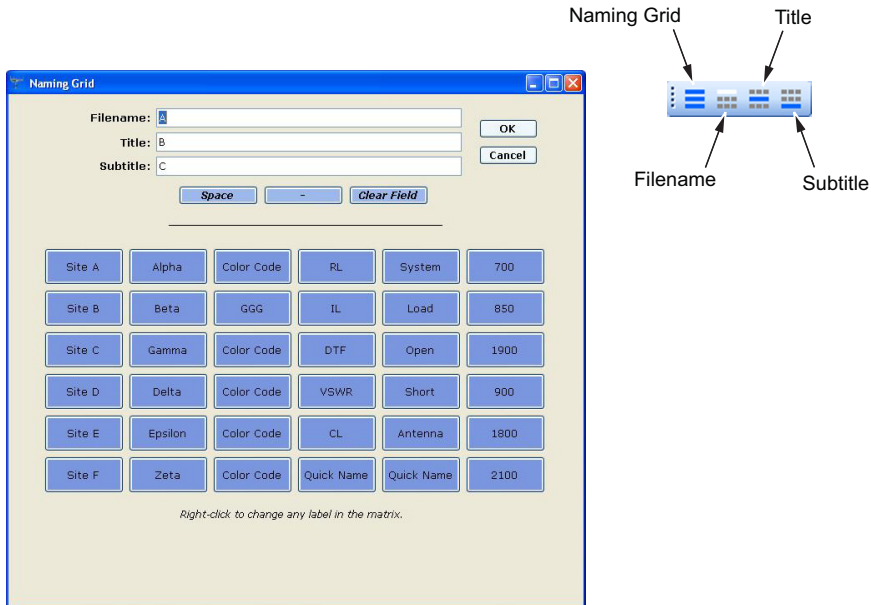
Figure 11-6. Naming Grid and Naming Grid Tool Bar

To use the naming grid:

1. Click on the left icon of the Naming Grid Tool Bar.

2. Place the cursor in the desired entry window – Filename, Title, or Subtitle.

3. Make an entry by typing the name on the keyboard or pressing the preset label buttons. All button entries are appended to the current entry window. Press the Clear Field button to clear any entries and start over.

Note	Right-clicking on a matrix label to change the text on the button.

4. After completing entries, press OK to close the naming grid.

5. Click on the icons shown in Figure 11-6 to apply the new title, subtitle, and/or filename (when using Save As) to the current trace.

6. If desired, use the arrow keys on the Marker Preset Tool Bar to go to the next trace.

Report Generator

To use the report generator in Line Sweep Tools, go to File menu and select Report Setup to tell Line Sweep Tools how you want the report to appear. In this case, the report will have the name of the contractor that did the work (Company field), the contractor logo, and will be generated in PDF format (Figure 11-7).
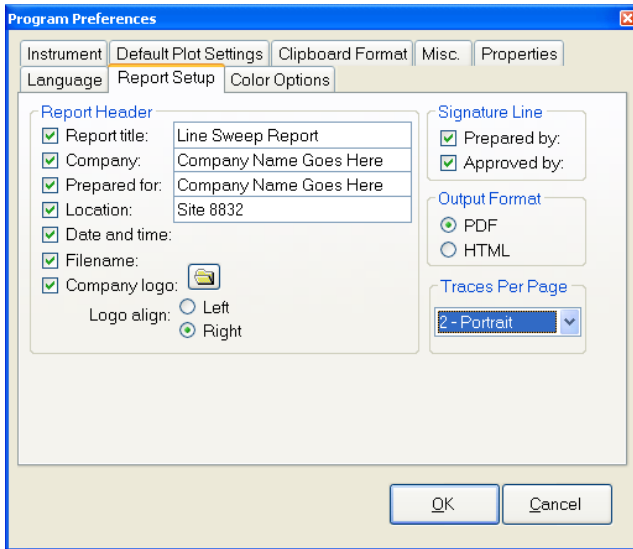
Figure 11-7. Report Setup Tab

Once the report generator is set up, File > Generate Report will create the PDF. The report will include all traces that were open at the time the report was made (Figure 11-8).
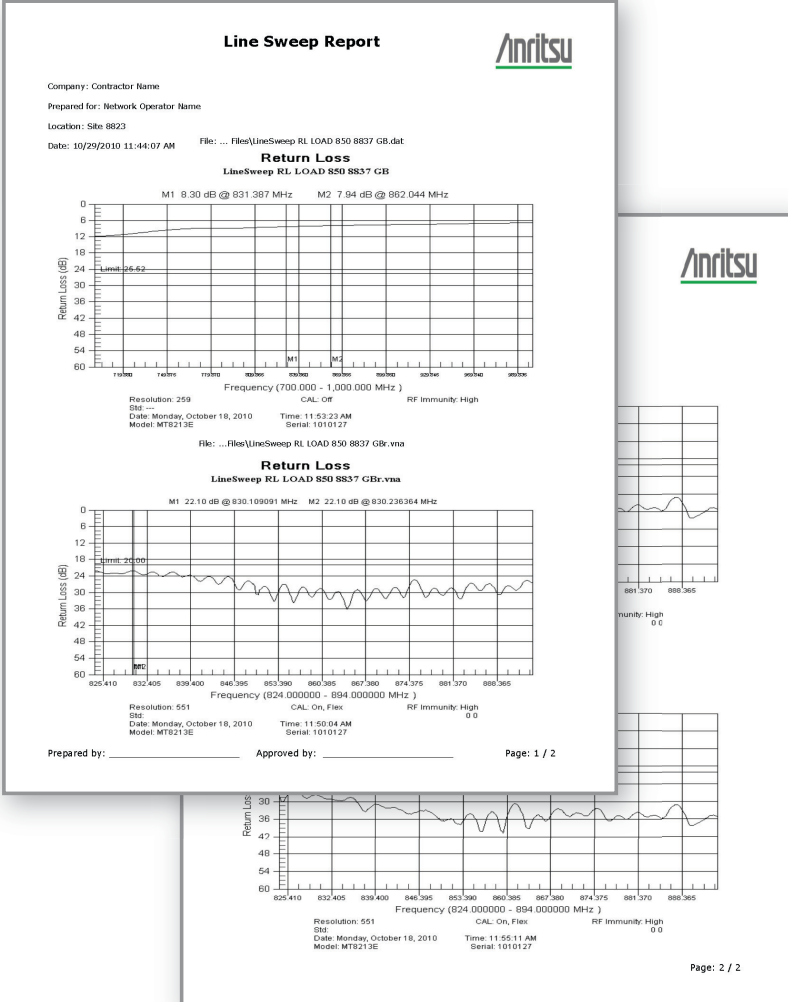
Figure 11-8. Generated Report

Chapter 12 — Anritsu easyTest Tools

12-1   Introduction

easyTest Tools allows users to create a test sequence (.ett) file on a PC. The file can be copied to the S331L via a USB memory stick and opened from the Menu screen by pressing the easyTest [icon] icon.

easyTest Tools files can:

- Display custom user images on the screen of the S331L. Images may include connection diagrams or procedure steps. Supports a variety of image types including .jpg, .bmp, and .png.

- Set instrument parameters to a specific state including measurement type, frequency and amplitude settings, limit lines, and markers. This is accomplished by including a previously saved instrument setup in the easyTest Tool file.

- Prompt the user with a message at the top of the display. While the message is displayed, the instrument can be unlocked for prompts requiring user action. An example message may be "Press the Autoscale button to zoom in on the trace".

- Include automatic or manual saving and naming of measurements or screen shots.

12-2   easyTest Tools on the PC

easyTest Tools is one of the software components contained in the Anritsu Tool Box, which is also available from the Anritsu web site and on the software disc. It is compatible with Windows XP/Vista/7. Refer to "Anritsu Tool Box" on page 11-1 and "Install the Software" on page 11-2 for information on the Tool Box and how to install the software.

After installing and launching easyTest Tools, perform the following steps to create an easyTest (.ett) file on the PC that can be opened on the S331L Site Master.

Figure 12-1 on page 12-2 shows an example of how a command looks in the software on a PC and also when recalled on the S331L.
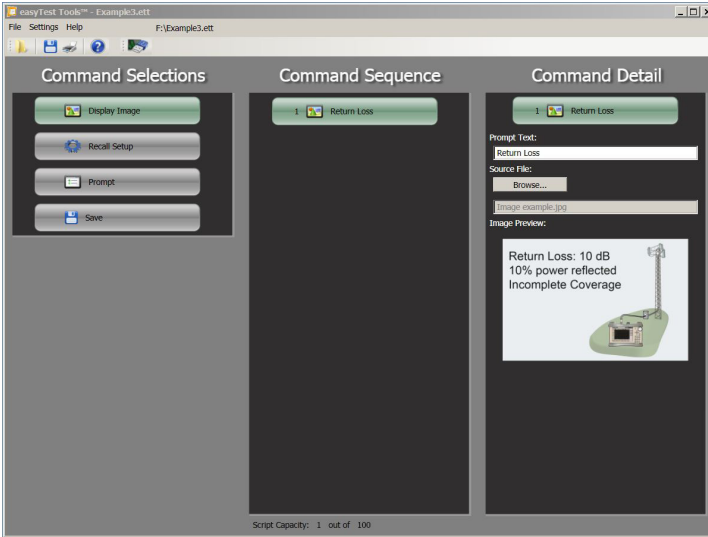
Example of Setup in easyTest Tools on the PC
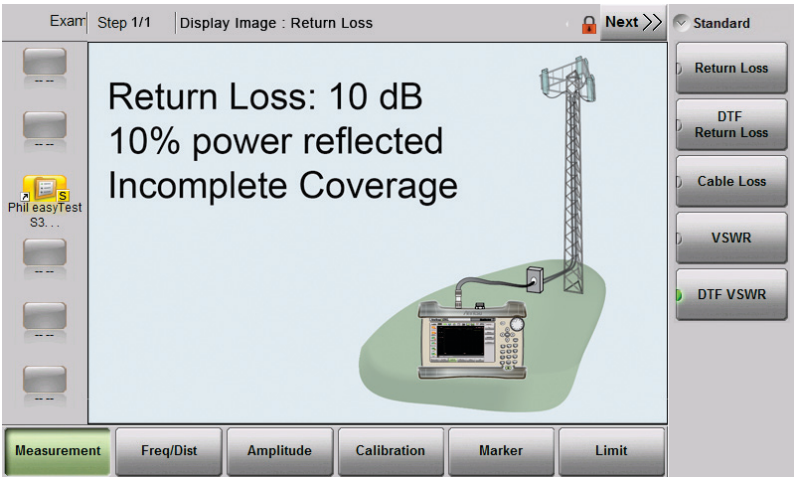
How the Setup is Displayed on the S331L Site Master

Figure 12-1. easyTest Tools on the PC and S331L

Create an easyTest File on the PC

1. Drag the desired steps from the Command Selections pane (left) into the Command Sequence pane (center). Refer to Figure 12-2.
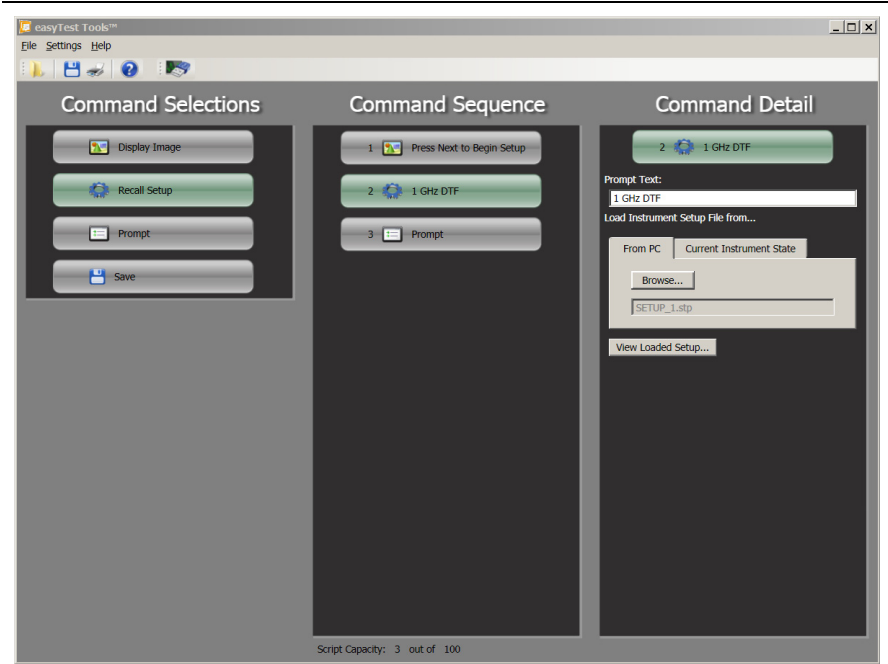
Figure 12-2. Creating an easyTest Tools Sequence

2. Set the order of the commands in the Command Sequence pane by clicking on a command and dragging it up or down. Delete a command by clicking on the command and pressing the Delete key on the keyboard.

3. Click on a command in the Command Sequence pane to view the details in Command Detail pane.

4. In the Command Detail pane, type the text to be displayed on the S331L in the Prompt Text field. Additional steps are dependant on the Command type:

- Display Image: Click the Browse... button and select a bitmap image to display on the instrument (Figure 12-1 on page 12-2).

- Recall Setup: Click the From PC tab and then click the Browse... button. In the Open menu, select a setup (.stp) file from the S331L that was previously saved using a USB memory stick.

Note	Refer to the Site Master S331L User Guide for information on saving setups and copying files.

The current instrument setting can also be used as the setup file. Connect the S331L to the PC using the USB A/5-pin to USB mini-B cable that was supplied with the S331L. Click the Current Instrument State tab and then click the Load Setup... button.

Click the View Loaded Setup... button to view some of the S331L setting that will be used in the easyTest Tools file (Figure 12-3).

Figure 12-3. Details of the Selected S331L Setup File

- Prompt: Check Lock Instrument for prompts that are informational only and do not require the operator to change any parameters. In the locked state, the only available actions are pressing the right arrow key or Next ⟩⟩ to advance a step, or pressing the **ESC** key to abort the easyTest file.

  Figure 12-4 shows examples of how locked and unlocked prompts are displayed on the S331L. Note the difference in the display of the lock icon.

Instrument Locked (Red)

Instrument Unlocked (Green)
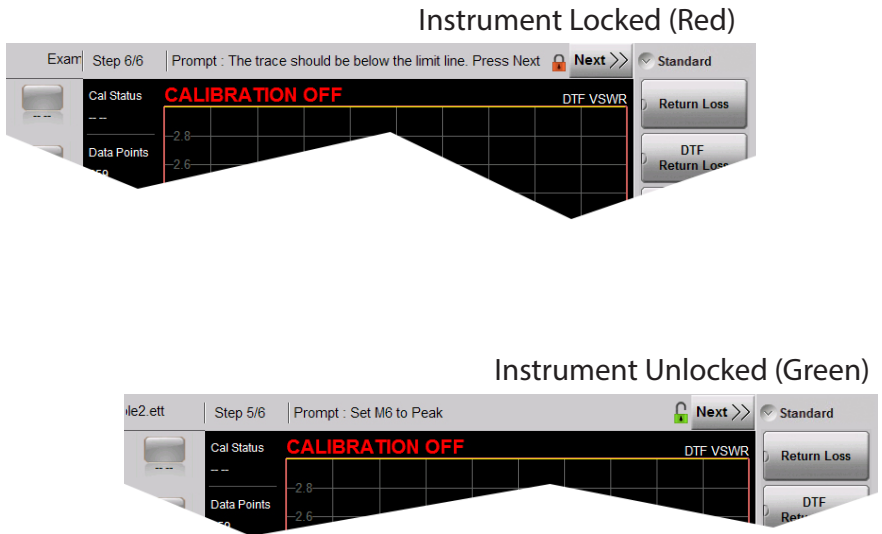
Figure 12-4. Icons Indicating Locked and Unlocked Prompt Commands

- Save: Select a base file name. This name will be the default file name for saved files. Incrementing numbers will be automatically appended to the base file name to prevent file overwrite.

  Select Automatic or Manual save mode and the file format to save, Measurement (.dat) files or Screenshot (.png) files.

Note	Refer to the easyTest Tools Help for additional information on Save options.

5. Save the easyTest (.ett) file to a USB Memory stick.

12-3   easyTest on the S331L

1. Insert the USB Memory stick with the easyTest (.ett) file in the S331L Site Master.

2. Press the **Menu** button.

3. Press the easyTest icon in the lower-right corner to display the easyTest Recall menu.
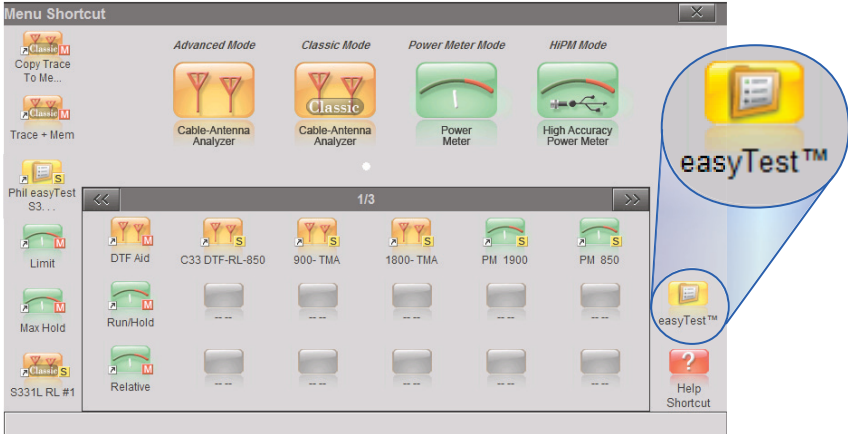
Figure 12-5. easyTest Icon

4. Select the file on the USB Memory stick and press Recall or **Enter** (Figure 12-6). Alternatively, copy the file to internal memory and recall the file from that location.
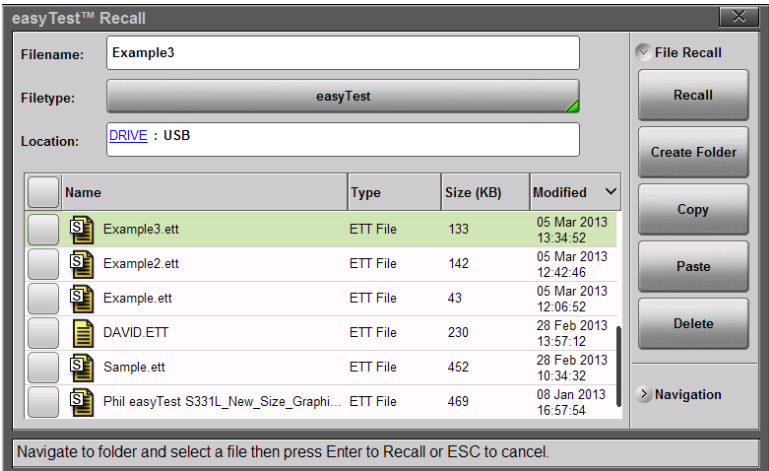
Figure 12-6. Recalling an easyTest File

5. Press   Next >>   to step through the file or **ESC** to abort.

Note	Refer to the Site Master S331L User Guide for information on recalling files and navigation.

Chapter 13 — Video Inspection Probe (VIP)

13-1 Introduction

Signal degradation may occur as a result of a dirty or damaged optic fiber ferrule endface. The Site Master S331L supports an application that lets you inspect fiber optic terminations, using a Video Inspection Probe (VIP) such as Anritsu Model G0306A. See Figure 13-1. The captured image and analysis results help determine if a connector should be cleaned or replaced. Pass/Fail evaluations are made in accordance with the IEC61300-3-35 standard. You can also save the data to file and generate test reports.

Figure 13-1. Anritsu G0306A Video Inspection Probe

13-2   Setup and Operation Summary

1. Attach to the VIP a probe tip, or ferrule adapter, that is compatible with the type of fiber optic connector you wish to test. Refer to "Connect the VIP" on page 13-3.

2. Connect the probe to the fiber optic endface and to the USB port on the Site Master S331L.

3. On the Site Master, select VIP Mode. Refer to "Launch the VIP Application" on page 13-4. The instrument screen will display a live image of the fiber edge surface.

4. Press the **Setup** main menu key and verify or change the VIP test settings, which include the probe model, tip type, and test profile. Refer to "VIP Test Settings" on page 13-4.

5. If needed, use the Focus Control knob on the probe to adjust the image focus.

6. Press the **Measurement** key on the Site Master screen, then press the Captured key to capture the displayed image.

7. Turn the rotary knob to zoom the captured image. Use the arrow keys to pan.

8. Press the Analyze key to execute analysis of the current VIP image. Detailed analysis results are displayed in tabular form if Auto is selected with the Results Table key.

9. To quickly save the captured image and test results using the current auto filename settings, press the Save icon on the "System Function Tool Bar" on page 2-20. You can also press the **Save/Recall** main menu key, then press Save to manually enter a file name and select its location.

10. Press **Report** if you wish to generate a report, in PDF format, on either the current or previously saved analysis results, or both.

13-3   VIP Setup

Follow the instructions in this section to connect the Video Inspection Probe, set the Site Master to VIP Mode, and select the VIP test settings. You can change these settings anytime via the Setup menu.

Connect the VIP

The Anritsu G0306A Video Inspection Probe comes with seven changeable probe tips: four standard tips (SC, LC, and FC) and three universal tips (1.25 mm and 2.5 mm). See Table 13-1. The standard tips are compatible with common types of bulkhead adapters. The universal tips are typically used for inspecting patch cords.

Table 13-1.   Probe Tip Types

Tip Type	Description
SC_APC_F	SC Angled Physical Contact, Female
SC_PC_F	SC Physical Contact, Female
LC_PC_F	LC Physical Contact, Female
FC_PC_F	FC Physical Contact, Female
2.5APC_M	Universal 2.5 mm Angled Physical Contact, Male
2.5PC_M	Universal 2.5 mm Physical Contact, Male
1.25PC_M	Universal 1.25 mm Physical Contact, Male

    1. Depending on the connector type you wish to test, attach the appropriate probe tip to the Video Inspection Probe.

    2. Connect the probe to the bulkhead or patch cord to be tested.

    3. Insert the USB connector at the end of the coiled cord into the S331L USB port.

Launch the VIP Application

If the S331L is currently running a different application, or measurement mode, press the **Menu** key, then press the VIP Mode application icon. See Figure 13-2.

Figure 13-2. Menu Screen

VIP Test Settings

To access the VIP test settings, press the Setup main menu key. Refer to "Setup Menu" on page 13-12 for a description of the submenu keys.

1. The Probe Model submenu key shows the currently selected VIP model. The Site Master currently supports only the Anritsu Model G0306A probe.

2. Press the Tip Type submenu key to display the selection box. Use the rotary knob or the **Up/Down** arrow keys to highlight the appropriate probe tip, then press Enter to save the setting. Table 13-1 on page 13-3 lists the available tip types.

   To close the Tip Type dialog without making a change, press the **Esc** key.

3. Press the Test Profile key to open the selection box. Use the rotary knob or the **Up/Down** arrow keys to highlight the desired profile, then press Enter to save the setting.

Test Profile

SM PC > 45 : Single-mode fiber, Physical Contact connector (Return Loss >45 dB)

SM APC :   Single-mode fiber, Angled Physical Contact connector

SM PC > 25 : Single-mode fiber, Physical Contact connector (Return Loss >25 dB)

MM PC 62.5 : Multi-mode fiber, Core diameter 62.5 µm

MM PC 50.0 : Multi-mode fiber, Core diameter 50 µm

Test Profile

Enter

Press Enter to save changes or ESC to close without saving.

Figure 13-3. VIP Test Profile Selection Box

4. If needed, press the Auto Analyze key to set it On or Off. When On, the VIP image is immediately analyzed when captured. Auto analysis is not performed if the setting is Off.

5. The Auto Filename key determines if a file name is automatically generated when saving a measurement or image to file. When this setting is On, the saved file name and location are taken from the auto filename settings.

6. Press the Auto Filename Settings submenu key to open the dialog box shown in Figure 13-4. Press the Location bar to change the save location. To edit the file prefix or the starting number, press the appropriate text box. You may also include the current date.

Auto Filename Settings

Location   \Internal\

File Prefix :   VIP

Start Number :   1

✔ Include Date

File name: VIP_25082015_0001.vipi

Enter
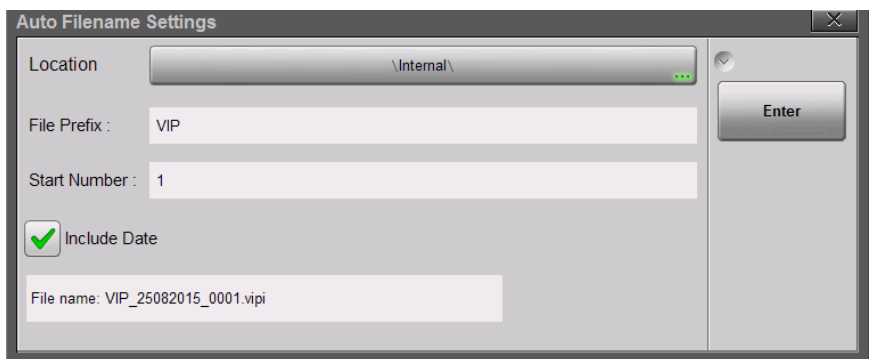
Figure 13-4. Auto Filename Settings Dialog

13-4   Operation

Once the Video Inspection Probe is properly connected and you have started the VIP application on the Site Master, a live view of the optical fiber endface should display on the instrument screen. See Figure 13-5.

Figure 13-5. VIP Image Live View

Note	Instead of capturing and analyzing a live VIP image, you can recall a previously saved image and perform VIP analysis on it. Refer to "Recall a VIP Image (VIP Mode Only)" on page 8-16.

VIP Image Analysis

Skip the first three steps below if the displayed VIP image is a recalled image.

1. While the display is in Live view, adjust the image focus if needed.

2. Press the **Measurement** main menu key to display the Measurement menu, shown in Figure 13-5.

3. Press the Captured key to capture the VIP image.

4. Optionally, use the rotary knob and arrow keys to zoom and pan the image, respectively. The Zoom Control Help key displays the related Help message.

5. To execute the VIP image analysis, press the Analyze submenu key. Skip this step if the Auto Analyze setting is On, in which case the image is automatically analyzed when captured (refer to the "Setup Menu" on page 13-12).

After the analysis completes, the overall Pass/Fail indicator is displayed in the lower left corner of the screen.

6. Press the Results Table submenu key to show or hide the detailed analysis results. See Figure 13-6. For each of the analysis areas, or zones (core, cladding, adhesive, contact), the table shows the count of scratches and contaminations or defects, and their Pass/Fail evaluation results. The table will not appear if there are no analysis results to display.
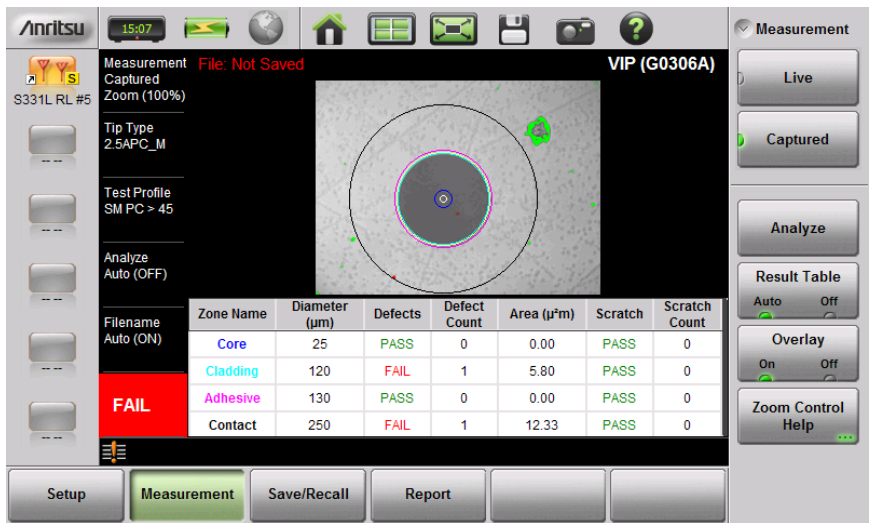

Figure 13-6. VIP Image Captured and Analyzed

7. Press the Overlay submenu key to turn on and off the colored circles around the analysis areas, and the red and green highlights showing the defects and scratches found on the connector endface. Defects of an acceptable size are green (Pass). Defects that are large enough to potentially cause a problem are highlighted in red (Fail).

8. To save the VIP data to file with one press of the touchscreen, press the Save icon in the "System Function Tool Bar". The current auto filename settings are applied to the saved file, provided the Auto Filename submenu key is set to On. Refer to "VIP Test Settings" on page 13-4.

   If Auto Filename is Off, or if you press the **Save/Recall** main menu key followed by Save, or press **Save** (7) on the numeric keypad, the Save dialog is displayed. See Figure 8-1 on page 8-2.

9. Enter the file name. Refer to "Choose the File Name" on page 8-7.

10. To select the type of file to save, press the Filetype button, then press the desired submenu key. See Figure 13-7.

    Measurement (.vipi) – Saves the VIP image and analysis results

    VIP Image (.png) – Saves the VIP image only

    ScreenShot (.png) – Saves a screen capture of the current display
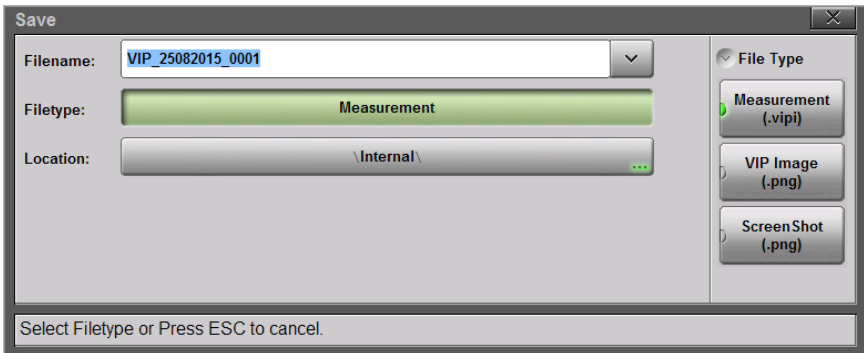
Figure 13-7. VIP File Type

11. Optionally, press the Location button and select the destination folder as described in "Set the Save Location" on page 8-3.

12. Press the Save button in the Save dialog.

If the overall analysis result is a Fail, follow standard practices to clean or replace the fiber optic connector.

VIP Reporting

You can output the captured VIP image and analysis results to a PDF-formatted file, using the **Report** main menu key. The report may include current or previously saved data, or both.
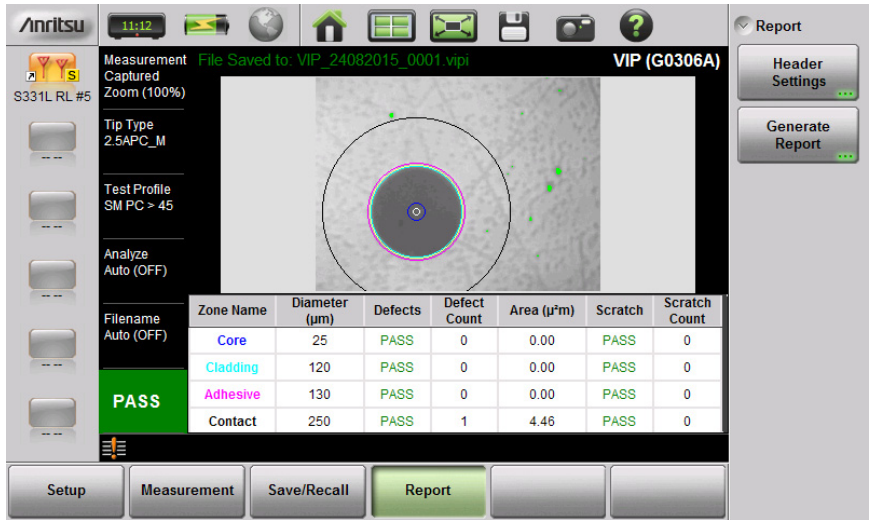
Figure 13-8. VIP Report Menu

>   **1.** Press Header Settings to enter or change the report header data.
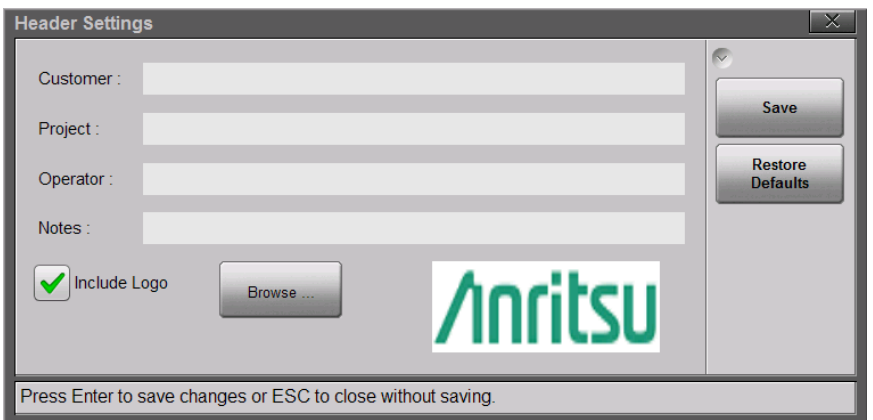
Figure 13-9. VIP Report Header Settings Dialog

2. In the Header Settings dialog box, press the text field to be edited and use the touchscreen keyboard to enter the information.

3. If you want the report to show your company logo, select the Include Logo checkbox and browse to the location of the desired logo image. This image must be in PNG format, and will be resized automatically.

4. Press Save to save the header information, which is retained until modified.

5. Press the Generate Report submenu key to open the dialog box in Figure 13-10.
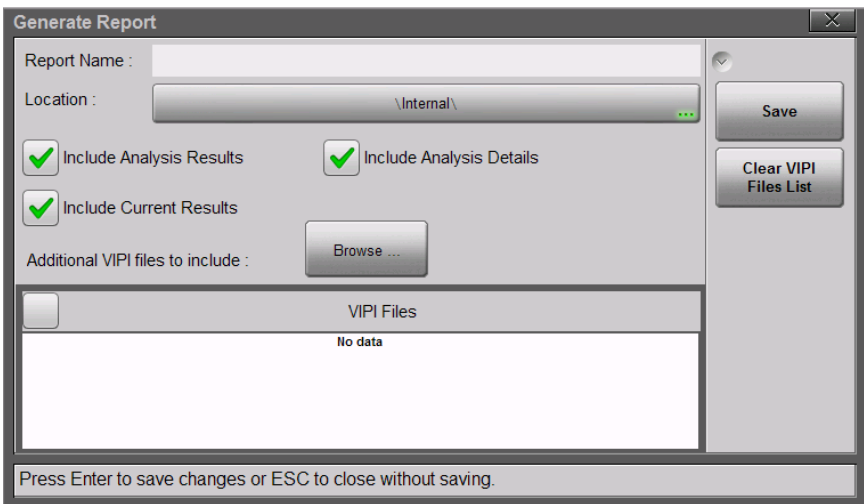
Figure 13-10. Generate Report Dialog

6. Enter the report name and select the destination folder as needed.

7. Optionally, press the Clear VIPI Files List button to remove saved files from the list included in the report.

8. Select or deselect the checkboxes as appropriate:

Analysis Results – Overall Pass/Fail result
Analysis Details – Detailed results by analysis area
Current Results – Image and analysis results of currently displayed VIP measurement
Additional VIPI Files – Previously saved measurement data

9. Press Save to generate the report.

13-5   VIP Menus

Figure 13-11 illustrates the menus available in VIP Mode. The main menu keys appear at the bottom of the display screen. The **Save/Recall** key brings up the same File menu as does the keypad menu key **File (1)**.

Figure 13-11. VIP Menu Map

Setup Menu

Key Sequence: **Setup**

Setup

Probe Model
G0306A

Tip Type
...

Test Profile
...

Auto Analyze
On   Off

Auto Filename
On   Off

Auto Filename
Settings
...

Probe Model: This submenu key shows the currently selected probe model. Press the key to display the list of supported VIP models from which you can select.

Tip Type: Press this submenu key to display the Tip Type selection box. Use the rotary knob or the **Up/Down** arrow keys to highlight the appropriate probe tip, then press Enter to save the setting. See Table 13-1 on page 13-3 for a list and description of possible selections.

To close the Tip Type dialog without making a change, press the **Esc** key.

Test Profile: Press this submenu key to select a profile that matches the type of fiber being tested. Use the rotary knob or the **Up/Down** arrow keys to highlight the appropriate probe tip, then press Enter to save the setting. See Figure 13-3 on page 13-5.

Auto Analyze On/Off: When set to On, the fiber endface image is automatically analyzed following capture. Select Auto Analyze Off if you want to view the image before manually executing the analysis.

Auto Filename On/Off: If Auto Filename is On, the file naming scheme currently defined in the Auto Filename Settings dialog is applied when you press the Save icon. With Auto Filename Off, pressing the Save icon opens the Save dialog the same way as pressing Save under the File menu would.

Auto Filename Settings: Press this submenu key to open a dialog box where you can preset the location and name of files to be saved. See Figure 13-4 on page 13-5. You can define a prefix (VIP is the factory default) and set the starting number from which file numbering will increment. You may also choose to include the current date in the file name, in the format DDMMYYYY. For example:

VIP_0001.vipi
VIP_21082015_0001.vipi

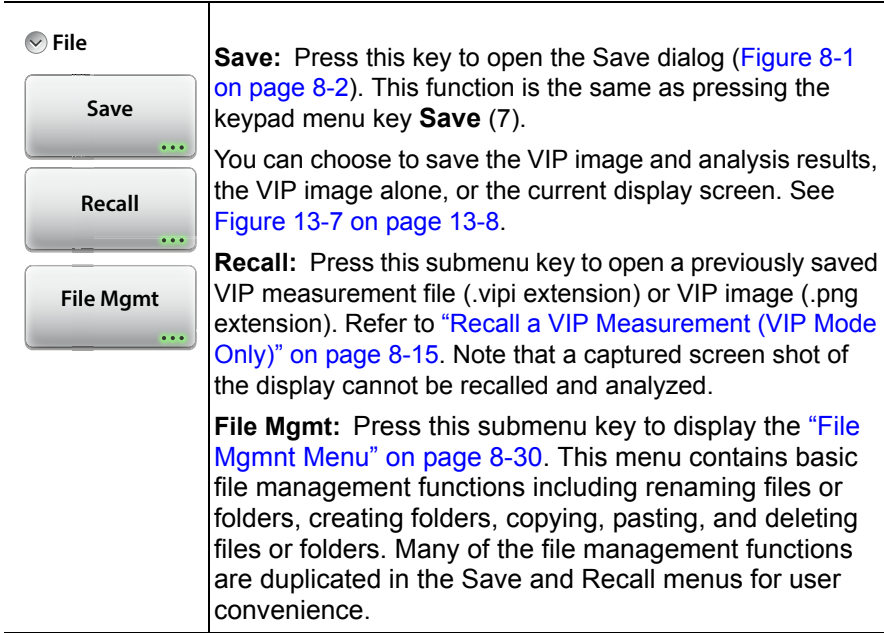---

Figure 13-12. VIP Setup Menu

Measurement Menu

Key Sequence: **Measurement**

◉ **Measurement**
 	
◗ **Live**
 	
◗ **Captured**
 	
Analyze
 	
Results Table
Auto   Off
 	
Overlay
On   Off
 	
Zoom Control
Help
	Live: In Live mode, the instrument displays a live view of the connector endface. Use the control on the probe to adjust the focus. The image cannot be panned or zoomed until it is captured.
	
	Captured: Press this submenu key to capture the currently displayed image, which you may then zoom and pan, using the rotary knob and arrow keys. The message "File Not Saved" is displayed at the top of the screen until you save the image and/or the measurement results.
	
	Analyze: Press this submenu key to start analysis of the VIP image. The overall Pass/Fail result is displayed in the lower left corner of the screen. If the Results Table setting is Auto, a table showing detailed results of the VIP test is also displayed.
	
	Results Table Auto/Off: This submenu key toggles on and off the table of detailed VIP test results. When set to Auto, the table will appear only when there are analysis results to display.
	
	Overlay On/Off: Press this submenu key to turn on and off the colored circles showing the analysis areas and to highlight any scratches and defects on the connector endface:
	
	    Green – Unimportant scratches and contaminations
	    Red – Serious scratches and contaminations that may impact signal quality
	
	Zoom Control Help: Press this submenu key to display a Help message with instructions on how to zoom and pan the image. Press Dismiss to close the message box.

Figure 13-13. VIP Measurement Menu

File Menu

Key Sequence: **Save/Recall**

⊙ **File** **Save** ... **Recall** ... **File Mgmt** ...	**Save:** Press this key to open the Save dialog (Figure 8-1 on page 8-2). This function is the same as pressing the keypad menu key **Save** (7).
	You can choose to save the VIP image and analysis results, the VIP image alone, or the current display screen. See Figure 13-7 on page 13-8.
	Recall: Press this submenu key to open a previously saved VIP measurement file (.vipi extension) or VIP image (.png extension). Refer to "Recall a VIP Measurement (VIP Mode Only)" on page 8-15. Note that a captured screen shot of the display cannot be recalled and analyzed.
	File Mgmt: Press this submenu key to display the "File Mgmnt Menu" on page 8-30. This menu contains basic file management functions including renaming files or folders, creating folders, copying, pasting, and deleting files or folders. Many of the file management functions are duplicated in the Save and Recall menus for user convenience.

Figure 13-14. File Menu

Report Menu

Key Sequence: **Report**

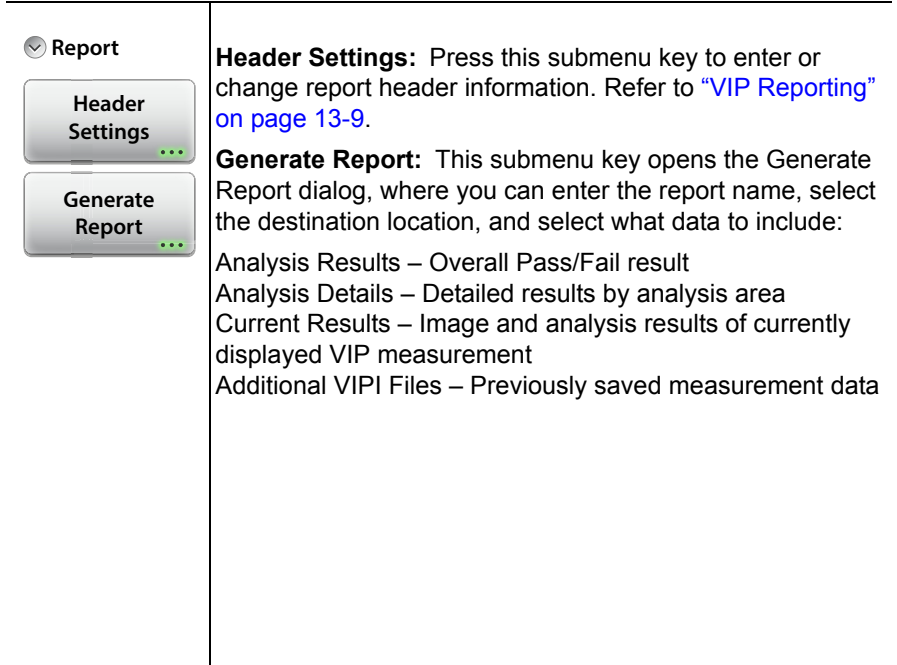|	
⊙ **Report** ┌─────────────┐ │ **Header** │ **Settings** │ ••• └─────────────┘ ┌─────────────┐ │ **Generate** │ **Report** │ ••• └─────────────┘	**Header Settings:** Press this submenu key to enter or change report header information. Refer to "VIP Reporting" on page 13-9. **Generate Report:** This submenu key opens the Generate Report dialog, where you can enter the report name, select the destination location, and select what data to include: Analysis Results – Overall Pass/Fail result Analysis Details – Detailed results by analysis area Current Results – Image and analysis results of currently displayed VIP measurement Additional VIPI Files – Previously saved measurement data

Figure 13-15. VIP Report Menu

Appendix A — Instrument Messages

A-1 Introduction

This appendix provides additional details regarding messages displayed on the S331L SiteMaster. The text of the dialog boxes are shown below and are listed in alphabetical order.

Example Message:

Message Shown in Instrument: Additional details or suggestions regarding the message.

1. **Command to USB device returns error or invalid data:** Check the connection to the USB device and try again.

2. **Device not ready:** Device being accessed is not ready or responding. Try to access again.

3. **EEPROM corrupted:** EEPROM device being accessed has been corrputed. Perform a Factory Reset under the "Preset Menu" on page 9-24 and then cycle the instrument power. If the error message persists, call your Anritsu Service Center.

4. **Encountered error in loading cable list. Default file restored:** The cable list file has been corrupted and will not be loaded. The default file has been used.

5. **Encountered error in loading keyboard settings. Default file restored:** The onscreen keyboard file has been corrupted and will not be loaded. The default file has been used.

6. **Encountered error in loading shortcut icon settings. Default file restored:** The menu shortcut file has been corrupted and will not be loaded. The default file has been used.

7. **Encountered error in restoring last setup. Default file restored:** The last setup file has been corrupted and will not be loaded. The default file has been used.

8. **Error executing remote command:** The remote command sent to the instrument has generated an unexpected error. Perform a Factory Reset and then cycle the power to the instrument. If error message persists, call your Anritsu Service Center.

9. **Error executing remote query command:** The remote query command sent to the instrument has generated an unexpected error. Perform a Factory Reset and then cycle the power to the instrument. If error message persists, call your Anritsu Service Center.

10. **Error occurred while zeroing. Please zero sensor without RF input:** When zeroing a USB power sensor, the RF input connector of the sensor must not be connected to any source of RF power. If RF power is detected during the zeroing, the calibration will fail and the zeroing will not be applied.

11. **File cannot be recalled:** File being recalled failed because the instrument model used when the file was saved does not match the current instrument model.

12. **File missing:** File being accessed cannot be found. The file has either been deleted or moved to a different location.

13. **Forward relative not applicable:** For the USB In-line power sensor, relative readings do not apply when making forward measurements of CCDF.

14. **Hardware driver failed to load:** One of the hardware drivers required has not loaded correctly. Perform a Factory Reset and then cycle the power to the instrument. If error message persists, call your Anritsu Service Center.

15. **Instacal - Power Meter Hardware not detected:** Error detecting Instacal/Power Meter module. Turn off the power to the instrument. Check that the hardware is installed correctly and then re-start the instrument. If error message persists, call your Anritsu Service Center.

16. **InstaCal Characterization data corrupted: Time Stamp:** Characterization data stored in the InstaCal module has been corrupted. Perform a Factory Reset and then cycle the power to the instrument. If error message persists, call your Anritsu Service Center.

17. **InstaCal Characterization data is corrupted:** Characterization data stored in the InstaCal module has been corrupted. Perform a Factory Reset and then recycle the power to the instrument. If error message persists, call your Anritsu Service Center.

18. **Loading USB Sensor ... :** The USB power sensor has been detected and a connection is being established to this sensor.

19. **Model Mismatch:** When recalling a setup file or measurement file, this message is displayed if the file being recalled was generated by an instrument that is not the same model as the one being used to recall the file.

20. **Module Board Serial Number is corrupted:** Serial number for the Instacal/Power Meter module has been corrupted. Perform a Factory Reset and then cycle the power to the instrument. If error message persists, call your Anritsu Service Center.

21. **PLL Lock failed:** Phase Lock Loop hardware has failed to lock. Perform a Factory Reset and then cycle the power to the instrument. If error message persists, call your Anritsu Service Center.

22. **Power Meter Characterization data corrupted:** Characterization data stored in the power meter module has been corrupted. Perform a Factory Reset and then recycle the power to the instrument. If error message persists, call your Anritsu Service Center.

23. **Recalling File...Failed:** An error was encountered while recalling the file. The recall process was aborted. Try again. If the error persists, the file may be corrupted.

24. **Reverse relative not applicable:** For the USB In-line power sensor, relative readings do not apply when making reverse measurements of Reflection Coefficient, Return Loss, or VSWR.

25. **Saving File…Failed:** An error was encountered while saving the file. The save process was aborted. Check that the destination location is accessible and try again. If the problem persists, the current setup may have corrupted parameters or data. Preset the instrument and try saving the file again.

26. **USB drive missing. Please connect one to either USB port:** No USB flash drive was found while copying log files. Check that the USB drive is installed correctly and try again.

27. **Verifying easyTest File ... :** When an easyTest file is first opened, a check is performed to ensure that the file is compatible with the instrument and that it is not corrupted. Once the verification passes the file is recalled. If it fails, a message box is displayed with more specific information about the failure.

28. **Zero Sensor completed:** The zeroing function performed on the attached USB power sensor has been completed.

Appendix B — Glossary of Terms

B-1   Introduction

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

B-2   Glossary Terms

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.

Attenuation :   Attenuation refers to the decreasing of 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.

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.

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 to change a specific instrument configuration parameter or parameters.

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.

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 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 -3dB loss indicates a 50% loss in power; a +3dB 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.

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. Specifically, dBd refers to signal gain in a dipole radiator.

dBm : 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.

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.

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.

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.
FM Modulation Index = (peak frequency deviation
/ 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 x 10E9) 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 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.

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).

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.

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. NF (the noise figure) is defined as the decibel value of the noise factor. NF = 10log (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.

OTA : Over-The-Air (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 point, 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 :   Power loss in a transmission cable due to mismatch reflection, cable loss, etc.

RF :   Radio Frequency (RF) generally refers to wireless communications with frequencies below 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.

Signal loss :   Signal loss is the amount of signal strength that's 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 : Short-Open-Line_Thru (SOLT) is a calibration (common coaxially) with simple and redundant standards. It is not band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies, and is poor with on-wafer.

TMA : A Tower Mounted Amplifier (TMA) amplifies signals from an antenna to reduce the noise figure 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)

Index

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