User Guide

Site Master™
S331L

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 Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA
http://www.anritsu.com

Part Number: 10580-00321
Revision: P
Published: April 2026
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Chapter 1 — General Information

1-1 Introduction

The Site Master S331L User Guide describes the instrument's system and file management functions and explains how to perform Cable and Antenna measurements.

About this Manual

This chapter provides a general overview and information about the Site Master S331L Cable and Antenna Analyzer and a description of manual conventions, additional documents, preventive maintenance, and annual verification requirements.

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 describes instrument functions in Cable and Antenna Analyzer Advanced Mode.

Chapter 4, "Classic Mode Operation" describes the menus available in the Classic Cable and Antenna Analyzer measurement mode, which emulates the user interface from the Anritsu "D" series Site Master instruments.

Chapter 5, "Internal Power Meter" describes how to use of the internal power meter.

Chapter 6, "High Accuracy Power Meter" describes the 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 Flex Cal 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” provides an overview of the Anritsu Line Sweep Tools (LST) and easyTest Tools.

Chapter 12, “Video Inspection Probe (VIP)” is a program used to test the condition of a fiber optic termination. A Video Inspection Probe like the Anritsu G0306A/B/C models.

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

Document Conventions

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

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

Freq/Dist > DTF Setup > Cable List

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.

For additional information and literature covering your product, visit the product page of your instrument and select the Library tab:

http://www.anritsu.com/en-us/test-measurement/products/s331l

Contacting Anritsu for Sales and Service

To contact Anritsu, visit anritsu.com/contact-us and select the services in your region.

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.

Anritsu Line Sweep Tools (LST) can be used with the Site Master to create reports, view and organize data, edit markers and limit lines, and perform trace analysis. LST is available for download on the Anritsu website.

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

- 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.

A complete suite of software applications are available for download at: anritsu.com/en-US/test-measurement/support/technical-support/handheld-tools-tool-box

SweepMasters DIRECT is an easy-to-use online 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.

Available Options

The Site Master S331L Technical Data Sheet (part number 11410-00616) contains a list and description of available options. The data sheet is available at http://www.anritsu.com.

Accessories

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

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-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, 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.

RF Input Warning

The Anritsu Site Master is a sensitive measuring instrument designed to measure low power levels. Avoid damaging this sensitive circuitry by observing the maximum input levels printed on the instrument connector labeling and specified in the product technical data sheet.

Depending on your instrument hardware revision, typical maximum input is +42 dBm or +23 dBm (±50 VDC). Check the RF Out/Reflect In connector labeling on the unit. The maximum RF input could be less if additional features, such as a preamplifier, are in use. Review the product technical data sheet or Anritsu website for recommended components and accessories that can help you protect your instrument. These include a variety of adapters, attenuators, filters, and RF detection accessories.

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. Flex Cal 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.

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).

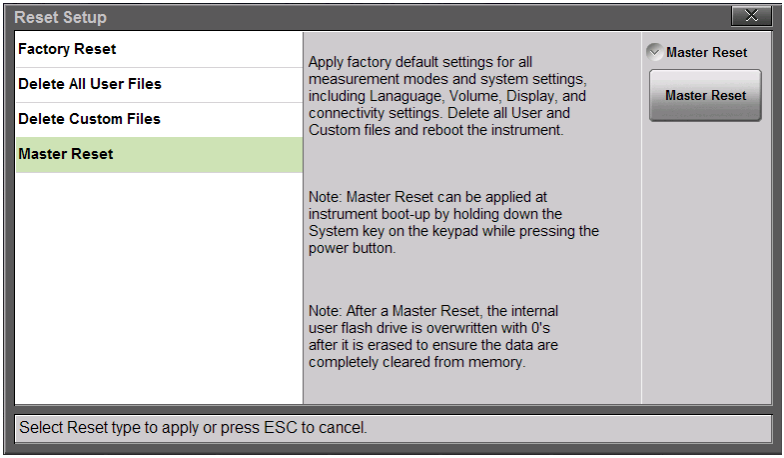


Figure 1-1. Master Reset

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).

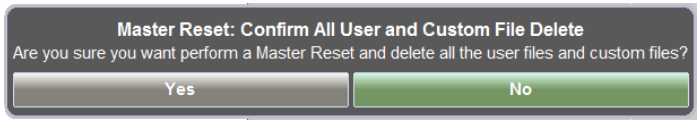


Figure 1-2. Master Reset Confirmation

4. Press Yes to complete the master reset.
5. The instrument is now reset.

Refer to the "Preset Menu" on page 9-23 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.

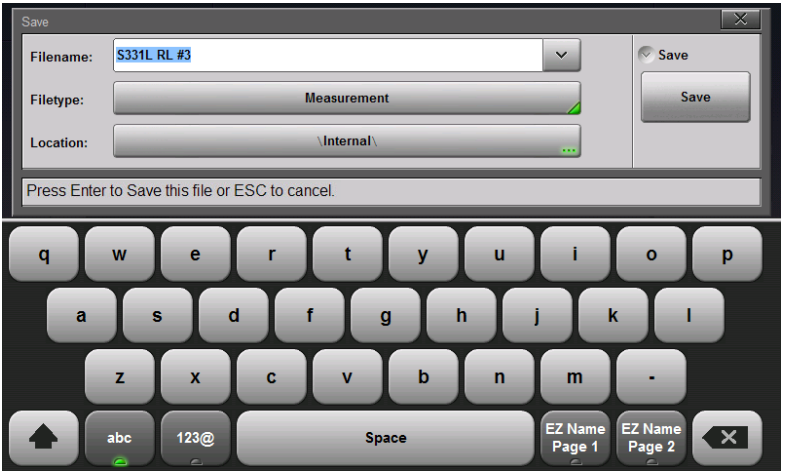


Figure 1-3. Choose a Storage Drive

3. Press the Location button then double-tap on the word DRIVE or press the left arrow key until the external USB drive is displayed.

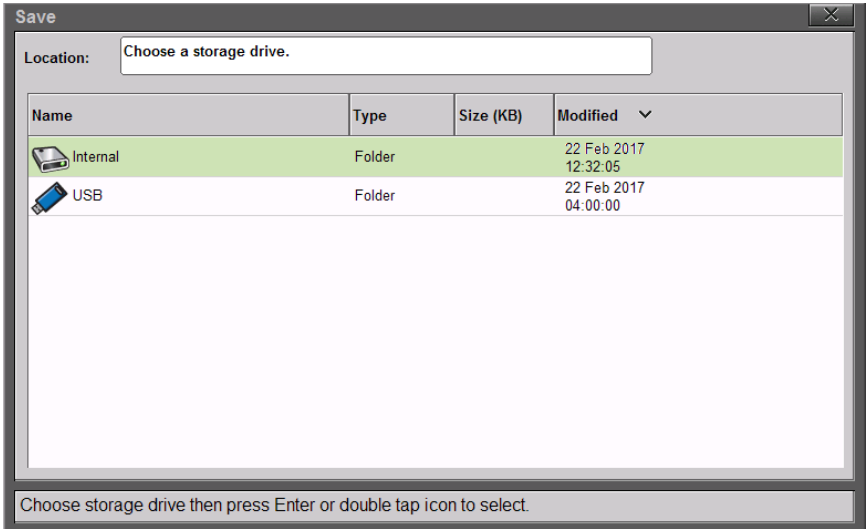


Figure 1-4. Choose a Storage Drive

4. Double-tap on USB. The Location breadcrumb will change to DRIVE : 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 2-2). 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.

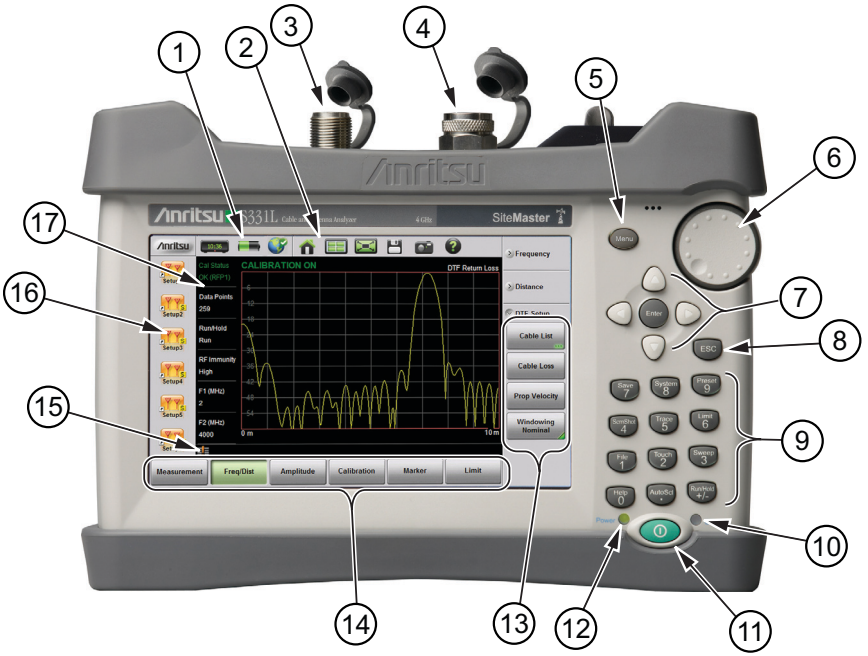


Figure 2-1. Site Master Instrument Overview (1 of 2)

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
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.

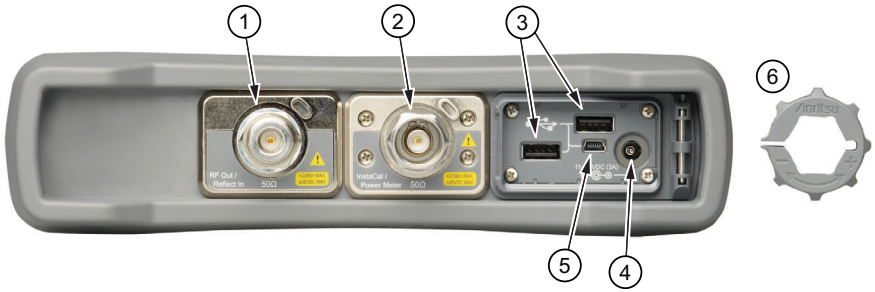


Figure 2-2. S331L Test Panel Connector (1 of 3)

1	RF Out/Reflect In port (Type N, Female) – 50 ohm impedance; depending on hardware revision, maximum input is +42 dBm or +23 dBm at ±50 VDC. Check connector label. 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.
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.

Figure 2-2. S331L Test Panel Connector (2 of 3)

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 9-15 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 (3 of 3)

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.

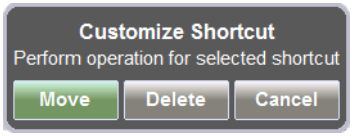
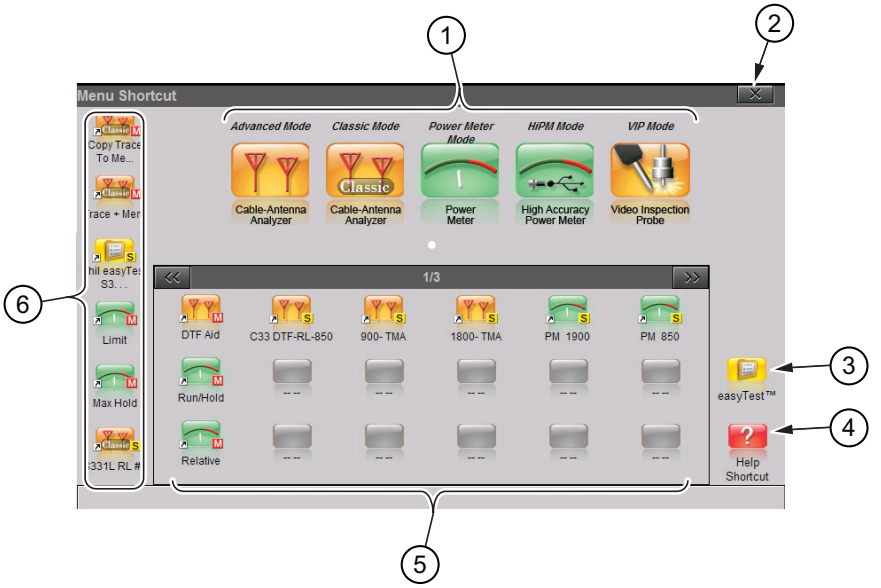


Figure 2-3. Customize Shortcut

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.



1	Installed Measurement Modes
2	Close Box
3	Icon to Launch easyTest. Refer to “easyTest Tools” on page 11-2.
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)

Figure 2-4. Menu Key Screen, Icons for Installed Measurements and Shortcuts

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 9-23 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 12.

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
	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.
	Allows the user to save, recall, copy, and delete files in internal memory or an external USB flash drive. Refer to Chapter 8.
	Opens the touchscreen calibration function. Refer to Chapter 9.
	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.
	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 9-10 for additional information.
	Displays the Trace menu. Trace operations include Copy Trace to Memory, Display Trace only, Display Memory only, Display Trace and Memory. Trace math functions include Trace – Memory, Trace + Memory, (Trace + Memory) / 2, or none. Not applicable in Power Meter mode. Refer to "Trace" on page 3-44 for detailed instructions.
	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
	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.
	Opens the System menu and provides access to System Information, System Setups, and Diagnostic tools. Refer to Chapter 9 for additional information.
	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.
	Auto scales the Amplitude axis. Refer to Chapter 3 for Cable & Antenna mode and Chapter 5 for Power Meter mode.
	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

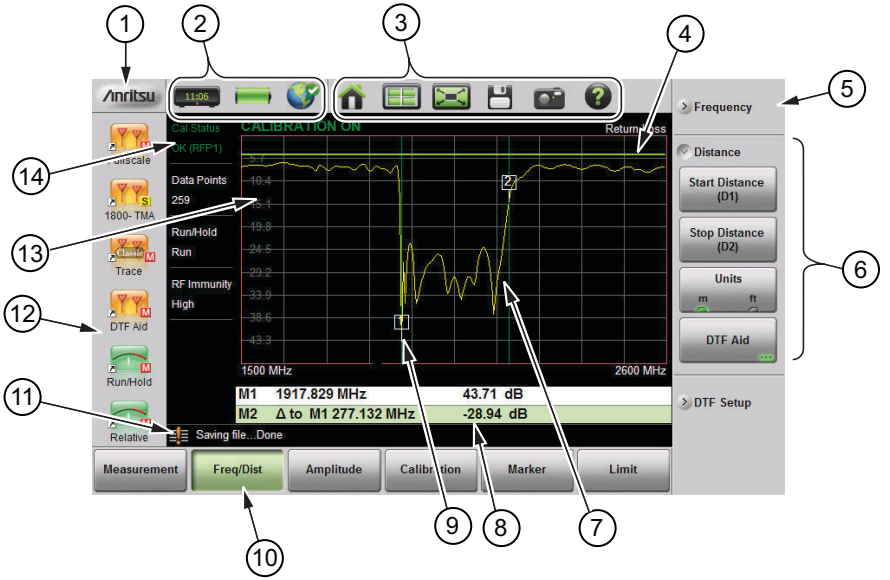
The LED is green when the Site Master is on and the battery is fully charged. The LED is orange when the battery is charging and off when the Site Master has no external power.

Press the battery icon  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.



1	Anritsu Logo. Displays the System Status dialog screen. Press **ESC** or  to close. Refer to the "Status Menu" on page 9-15 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.

Figure 2-5. Site Master Display Overview (1 of 2)

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 3-37.
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).

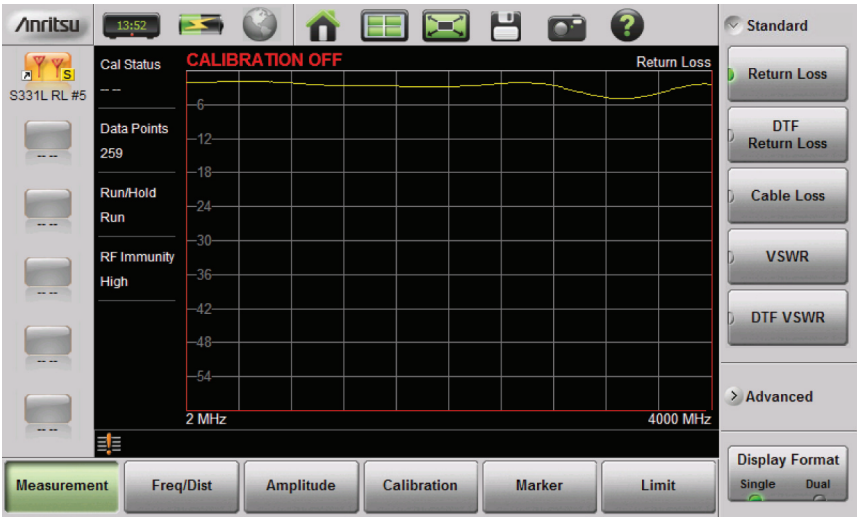


Figure 2-6. Return Loss Measurement

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)

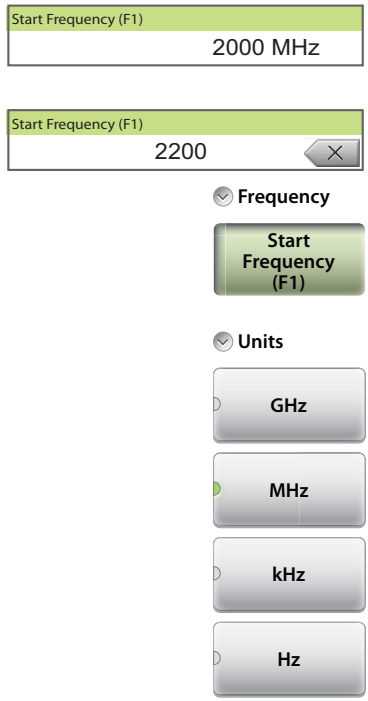
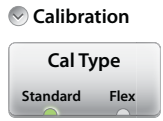
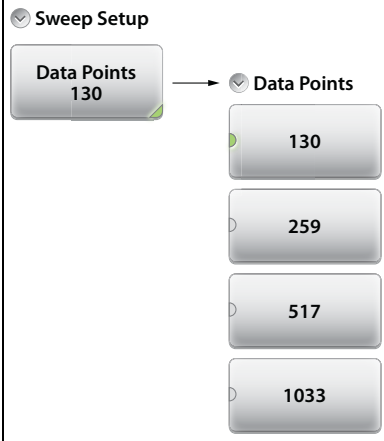
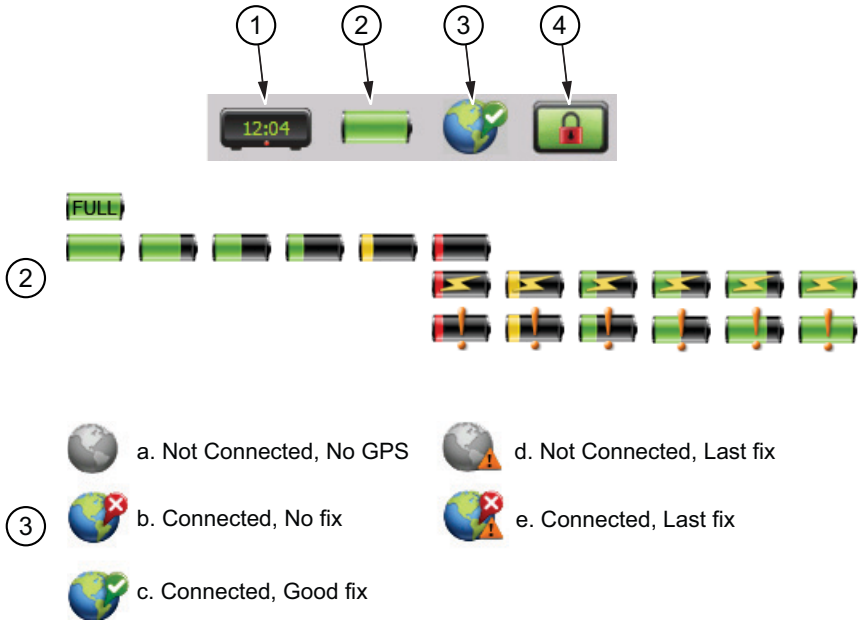
Button Description	Button Example
1. Numeric Entry *example:* Start Frequency (F1) button in the **Freq/Dist** menu. Opens a "Edit Parameter Window". Change the current value using the rotary knob, Up/Down arrow keys, or numeric keypad. Using the keypad will display terminator buttons. Press one of the 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.	
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.	

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.	
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.	
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.	
6. Action Pressing an Action button triggers the submenu button function.	

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 9-13.
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.

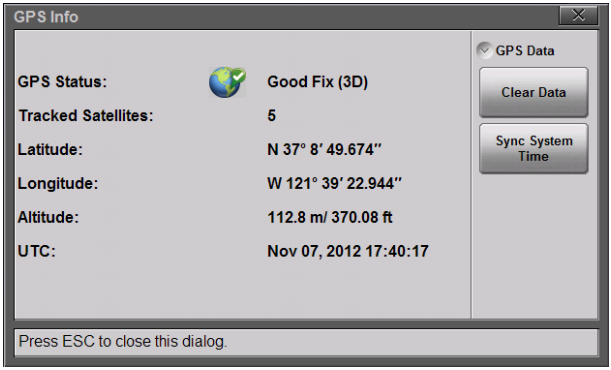


Figure 2-8. GPS Info

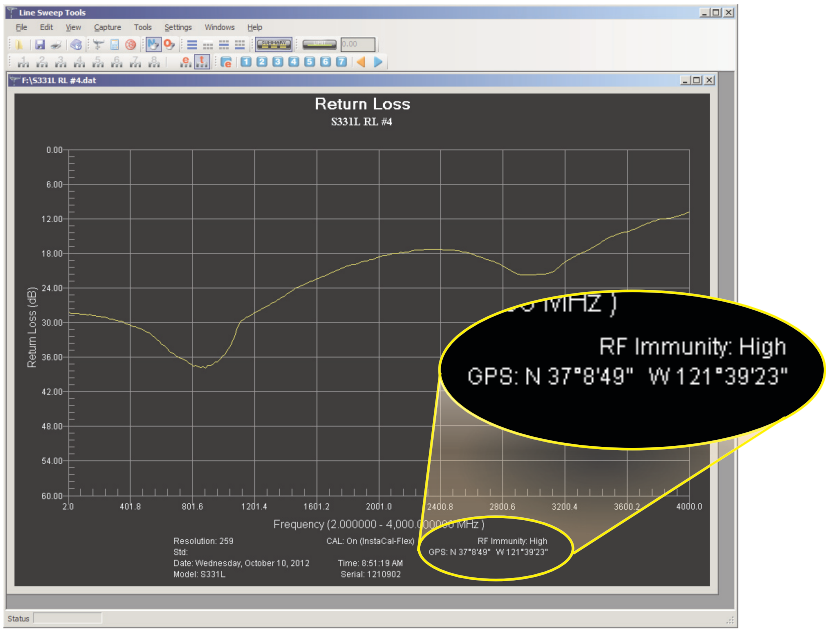
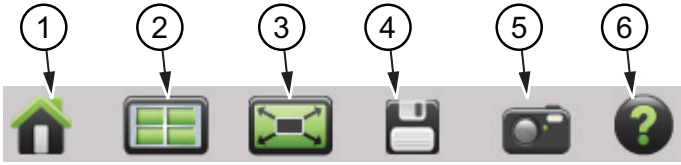


Figure 2-9. Location Data Saved in Measurement File

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 9-23 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 File" on page 8-3 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 9-10 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

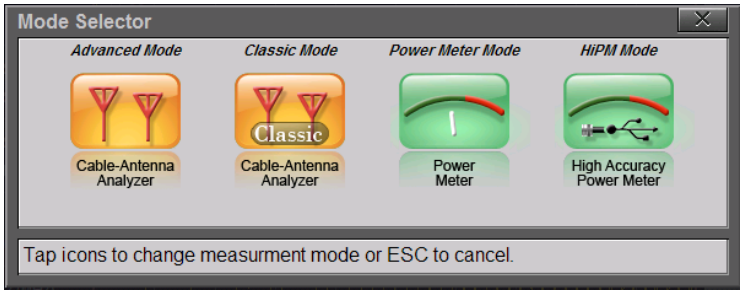
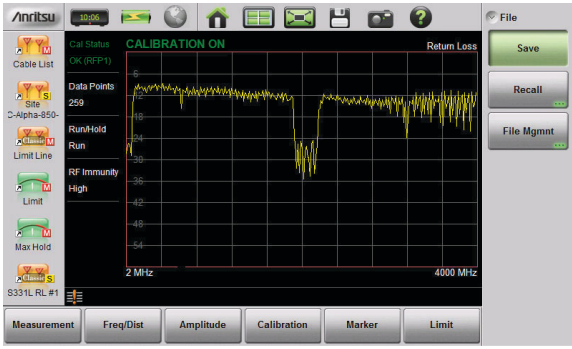
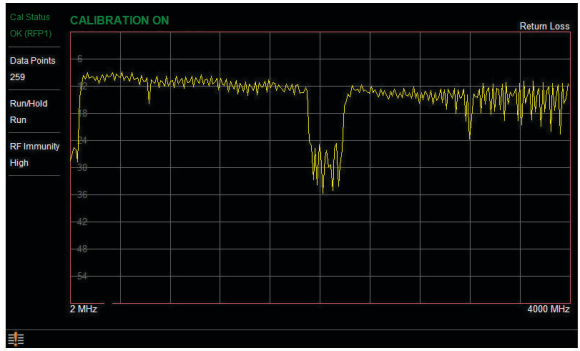


Figure 2-11. Mode Selector Table



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.

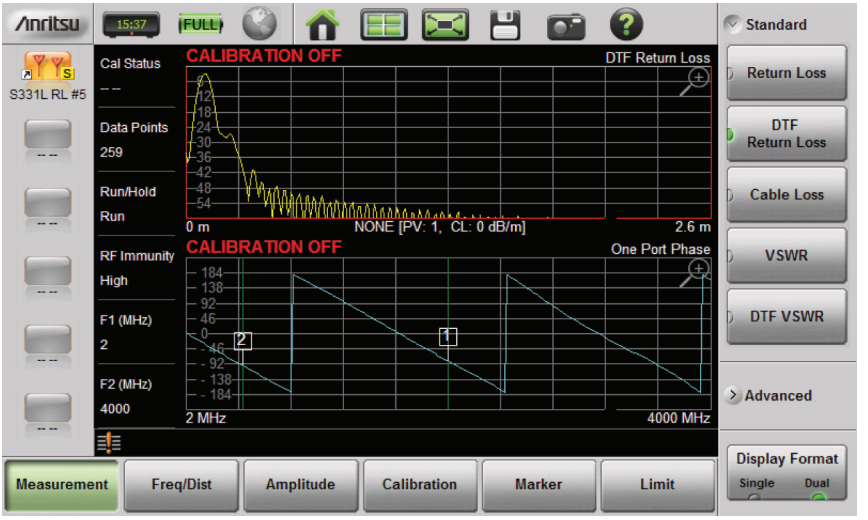


Figure 2-13. Dual Display Format with Top Display Active

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.

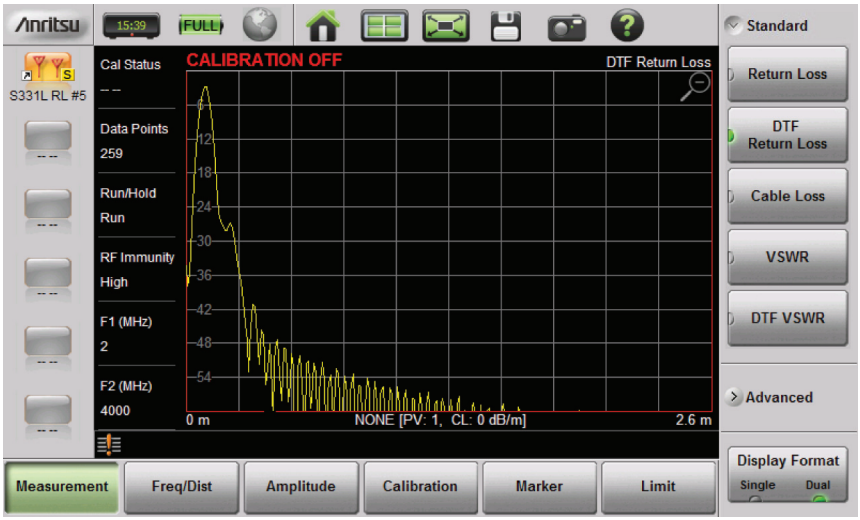


Figure 2-14. Dual Display Format with Top Display Maximized

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 file name will contain references to both trace types, but you can change the name, as with any file. Refer to "Rename File" on page 8-15.

Display Modes

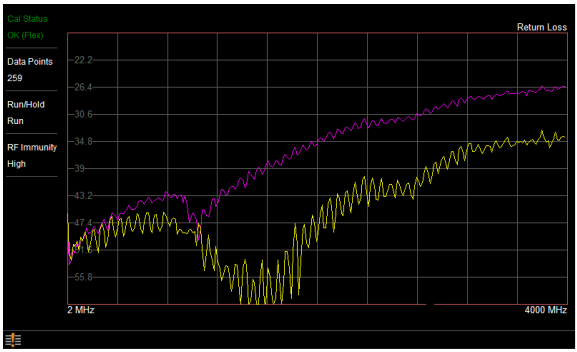
The Site Master S331L offers the following display color schemes:

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

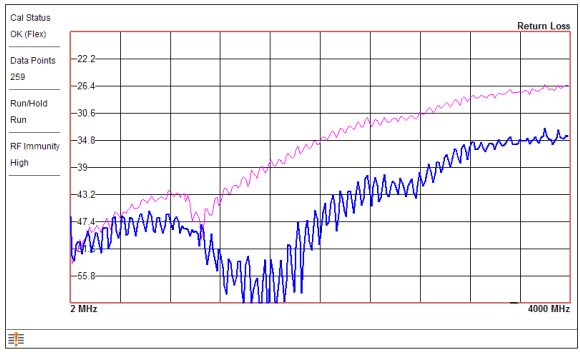
Daytime is used for challenging daytime viewing conditions requiring increased contrast.

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

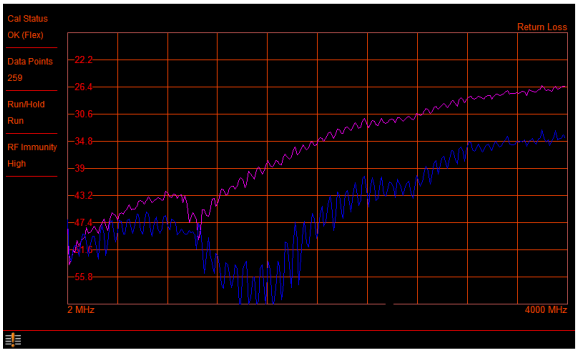
To change the display mode, press **System** (8) > System Setups > Display/Audio and select one of the Color Schemes from the pull-down menu. Press **Enter** to set or **ESC** to close the Display/Audio Settings window without making a change. Refer to "Display/Audio Menu" on page 9-18.



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) CALIBRATION ON

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

Cal Status OK (RFP1) CALIBRATION ON

The Site Master has been calibrated for an OSL 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 Flex 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 °C 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.

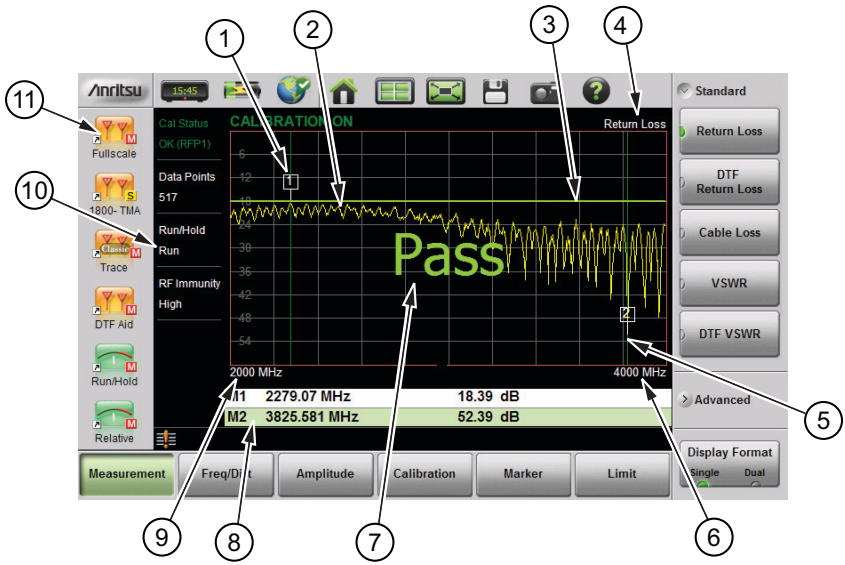
Chapter 3 — Cable and Antenna Measurements

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)
4	Measurement Type

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

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.

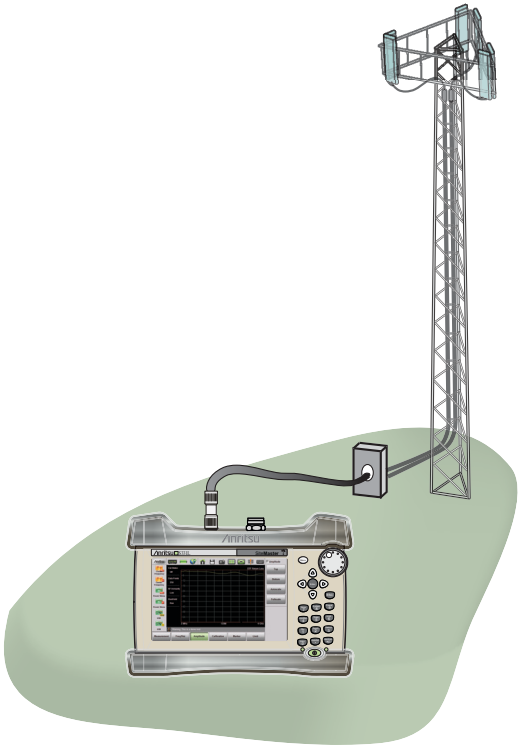


Figure 3-2. Cable and Antenna Line Sweeping

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.

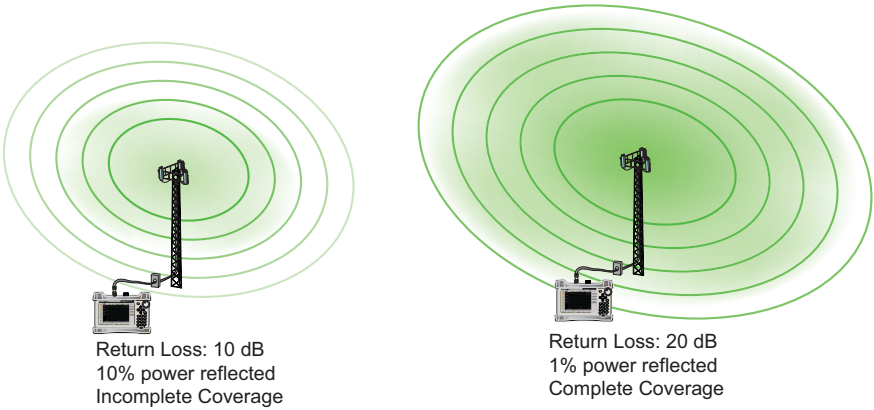


Figure 3-3. Coverage Area

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.

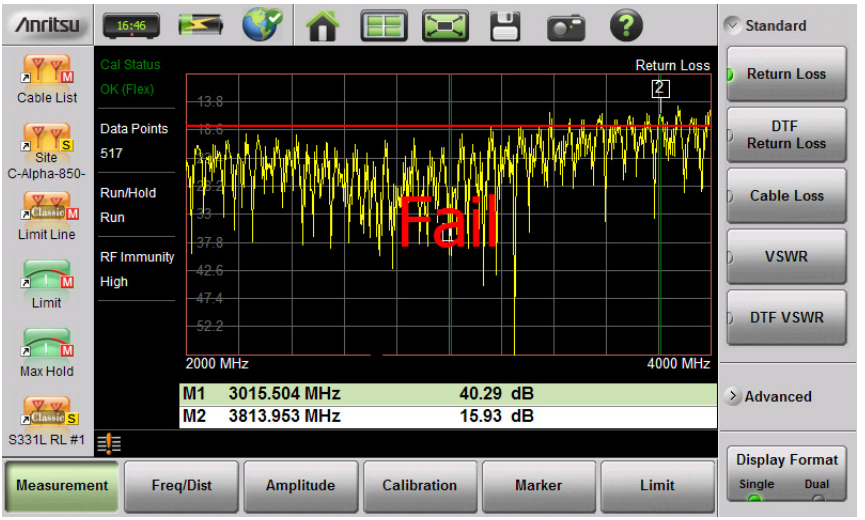
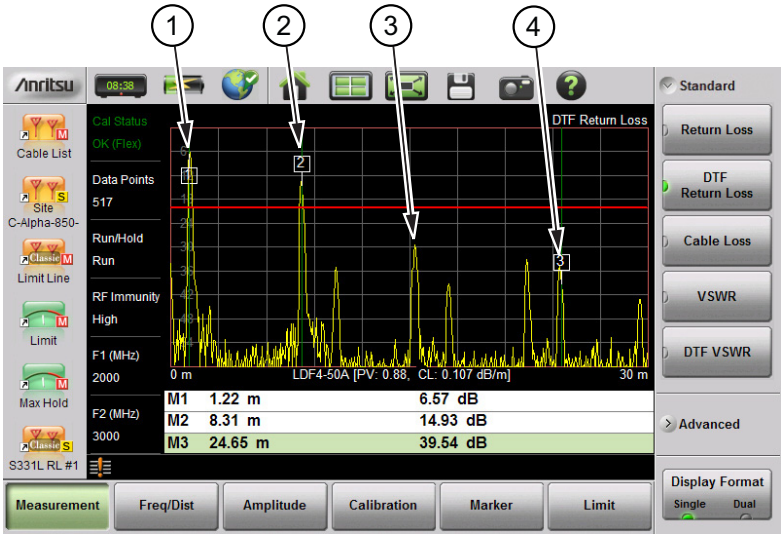


Figure 3-4. Failed Return Loss Measurement



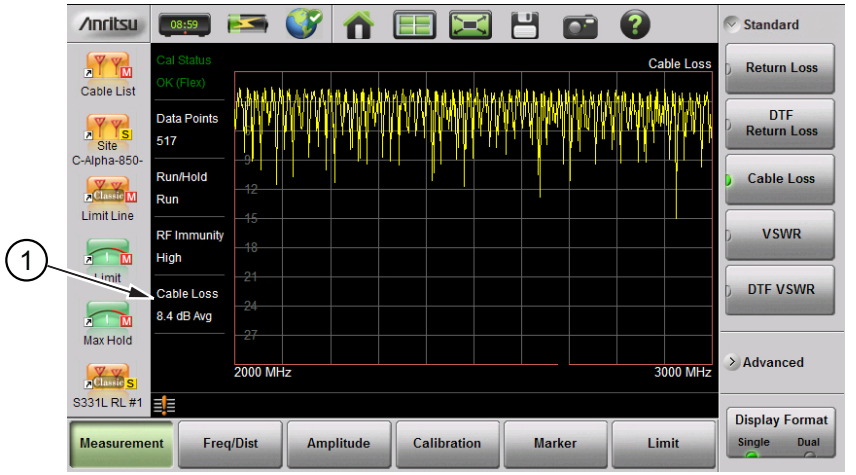
1	Failure at Jumper (1.22 m)
2	Possible Failure at 8.31 m
3	Example of Good Connector (~30 dB)
4	Precision Load Connected at End of Cable (24.65 m)

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 several cable types.

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

Note	Cable Loss cannot be measured with an antenna connected.



1	Average Cable Loss

Figure 3-6. 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 Flex, 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 can be performed:

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

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

Return Loss/VSWR Measurement

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

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

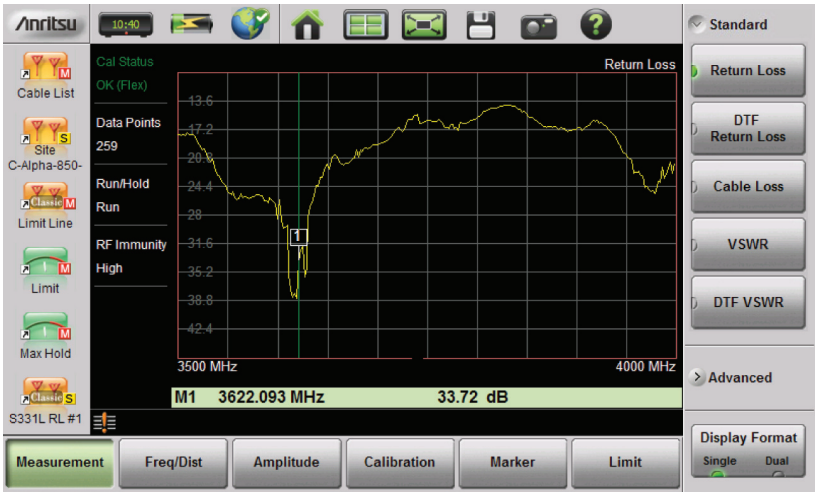


Figure 3-7. Antenna Return Loss Trace

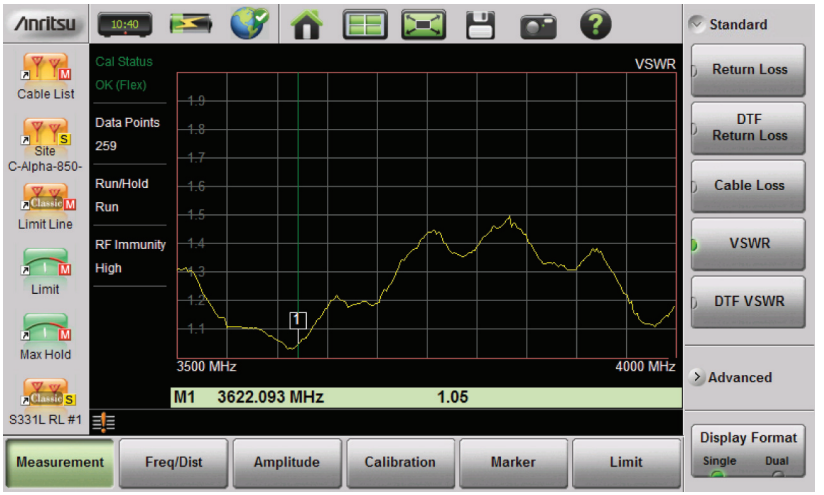


Figure 3-8. Same Antenna Trace in VSWR

The following describes the main steps to follow when making Return Loss or VSWR measurements.

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 3-37.
7. Press the **Limit** main menu key to enter and set the limit line as described in "Limit Lines" on page 3-31.
8. Press **Save** (7) then Save to save the measurement to memory. Refer to "Save File" on page 8-3 for details on setting the save location.

Cable Loss Measurement

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

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

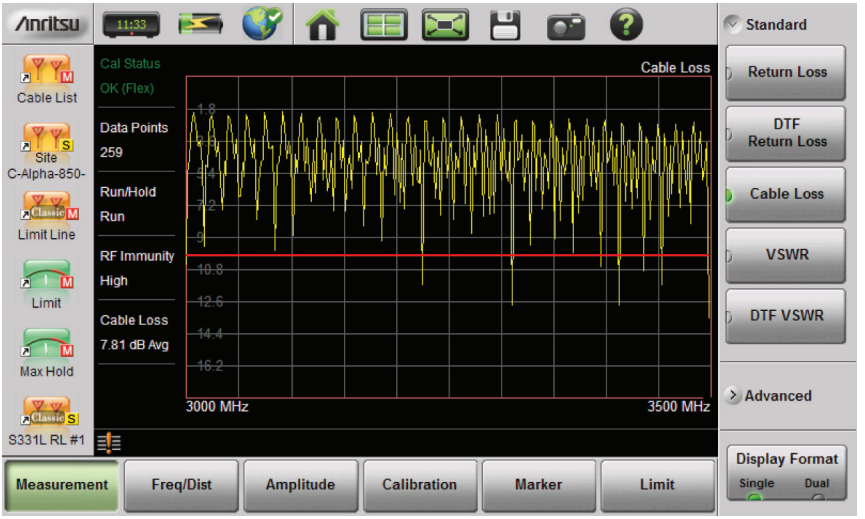


Figure 3-9. Cable Loss Measurement

The following describes the main steps to follow when making Cable Loss measurements.

1. Press the **Measurement** main menu key and select Cable Loss.
2. Press the **Freq/Dist** 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 3-31. 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 File" on page 8-3 for details on setting the save location.

DTF Measurement

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

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

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

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

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

Using DTF Aid

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

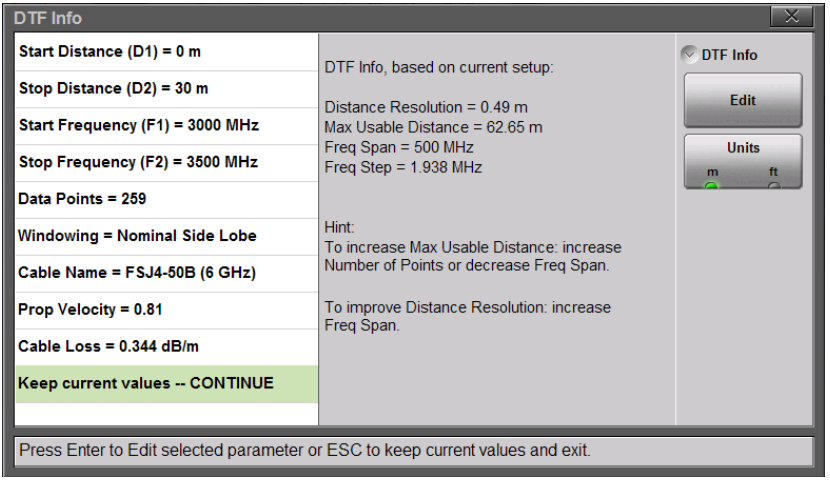


Figure 3-10. DTF Aid

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 (PV) 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 cable types, choose the main feeder cable.

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

Custom Cables can be created and uploaded to the instrument using Line Sweep Tools (LST). Instructions for using the LST Cable Editor are available in the software Help menu. The 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 are displayed below the trace window during distance measurements (**Measurement** > DTF Return Loss or DTF VSWR) as shown in Figure 3-11.

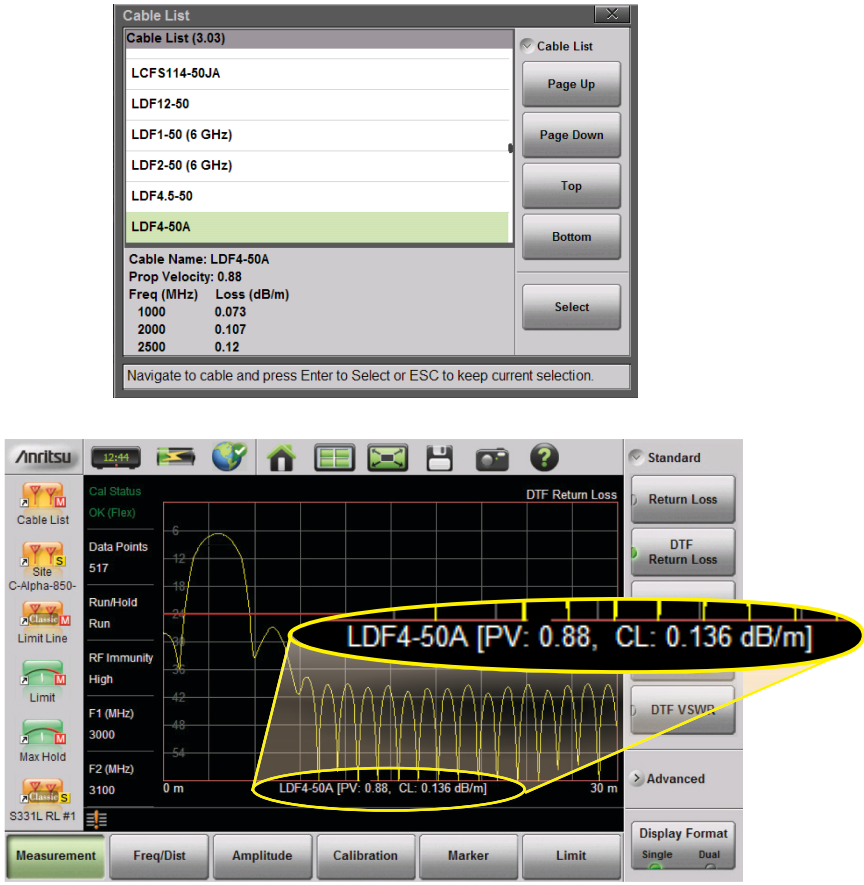


Figure 3-11. Cable List Selection Displayed Under Graticule

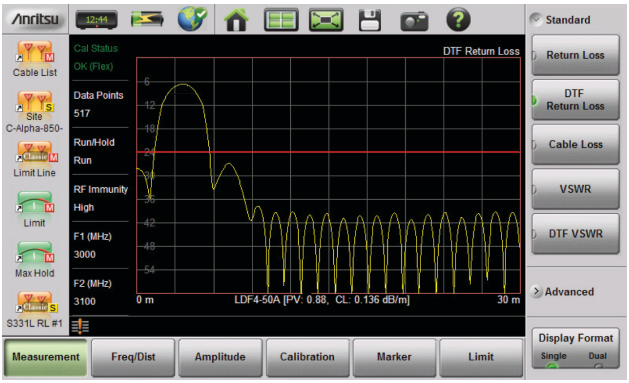
Distance Resolution

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

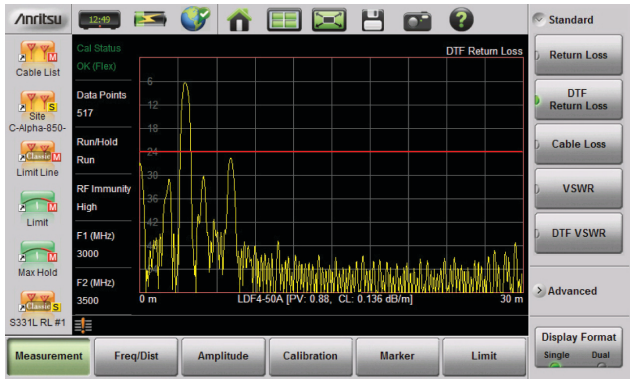
$$\text{Distance Resolution (m)} = 1.5 \times 10^8 \times PV / \Delta F \text{ (in Hz)}$$

with Rectangular Windowing applied.

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 close 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.*

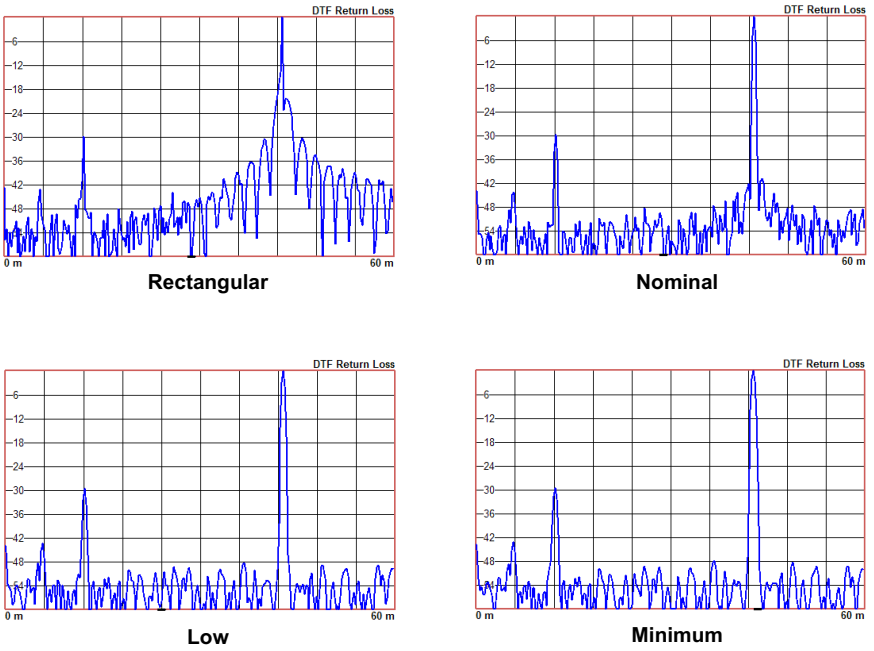


Figure 3-13. Effects of Windowing on a Sample Trace

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

The following describes the main steps to follow when making DTF Return Loss or DTF VSWR measurements.

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, 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 3-20 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).

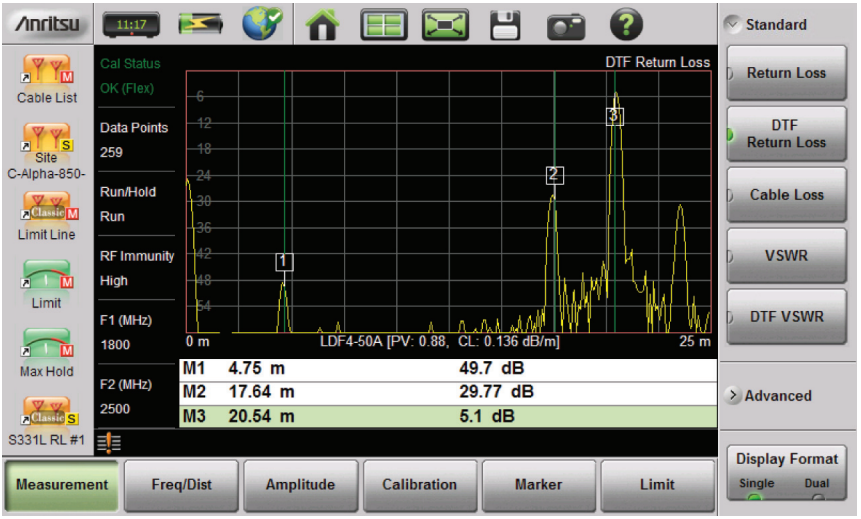


Figure 3-14. DTF Return Loss with a Short at the End of the Cable (20.5 m)

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 3-21 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 3-21).

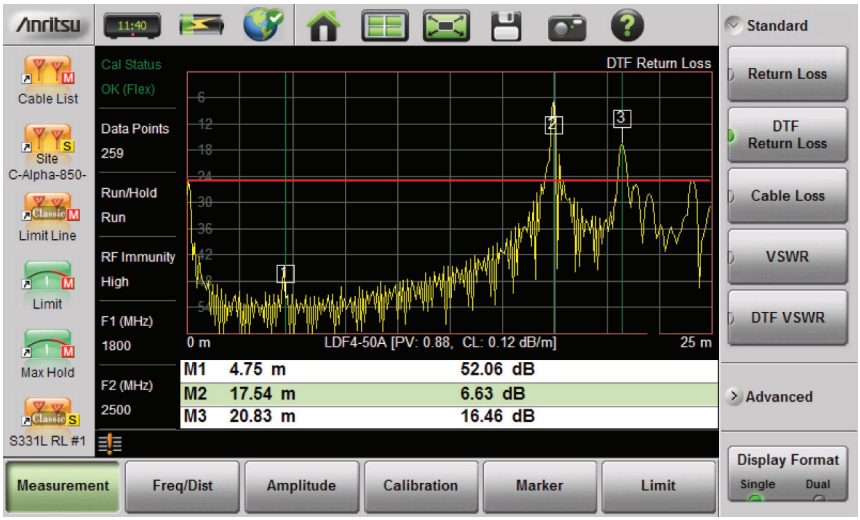


Figure 3-15. DTF Return Loss Measurement (Antenna at 20.83 m)

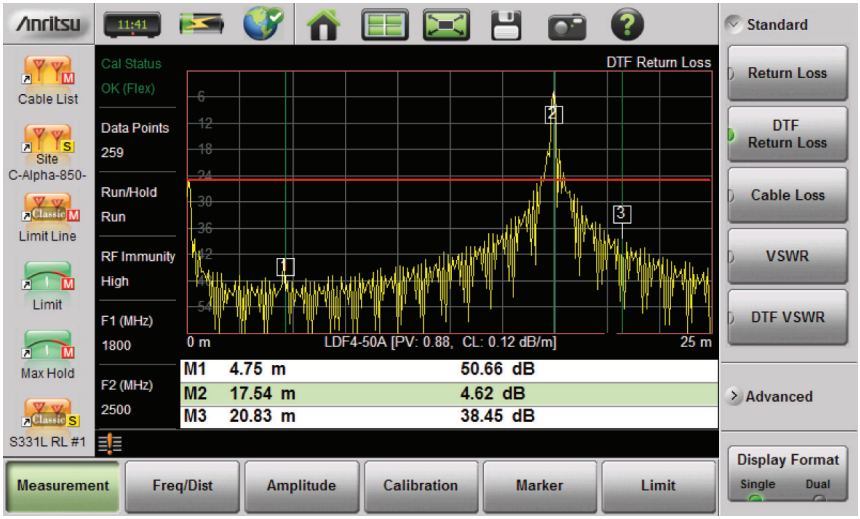


Figure 3-16. Failing DTF Return Loss Measurement (Load at 20.83 m)

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).

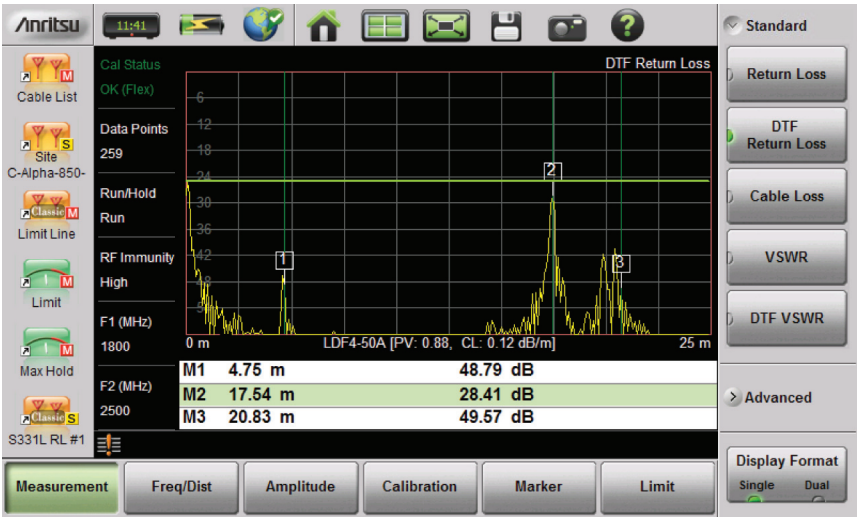


Figure 3-17. Passing DTF Return Loss Measurement (Load at 20.83 m)

Figure 3-18 shows the same system with the antenna reattached. The reflection of the jumper connector in now reduced to 27.64 dB.

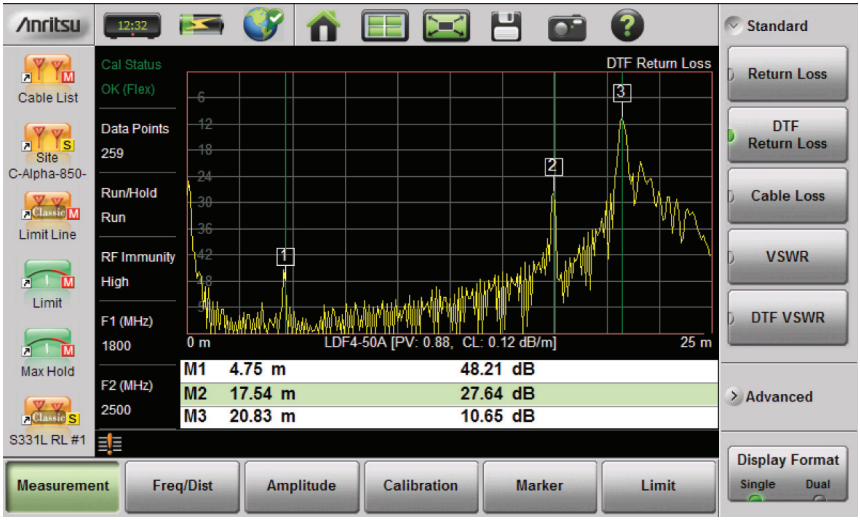


Figure 3-18. DTF Return Loss Measurement (Antenna at 20.83 m)

3-5 Advanced Measurements

Smith Chart

The Smith Chart is a graphical tool for plotting impedance data versus frequency. It converts the measured reflection coefficient data into impedance data and displays it in a manner that makes the Smith Chart a useful tool for determining and tuning input match. Markers can be used to read the real and imaginary parts of the complex impedance. See the example in Figure 3-19. 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 3-57.

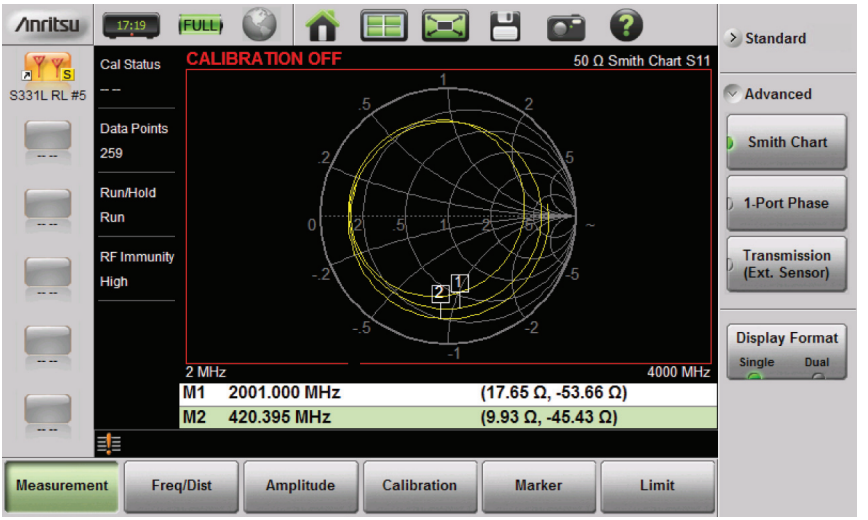


Figure 3-19. Smith Chart Measurement

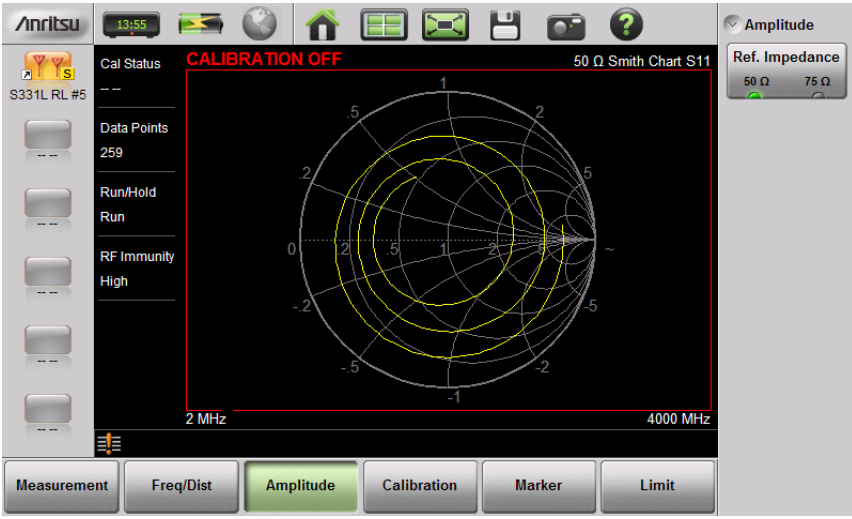


Figure 3-20. Set Reference Impedance for Smith Chart Calculations

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).

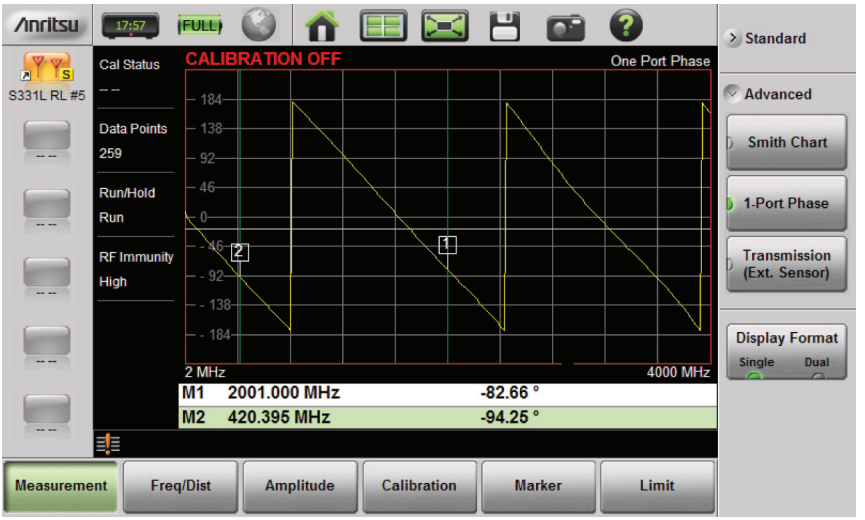


Figure 3-21. 1-Port Phase Measurement

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 with an external sensor transmission.

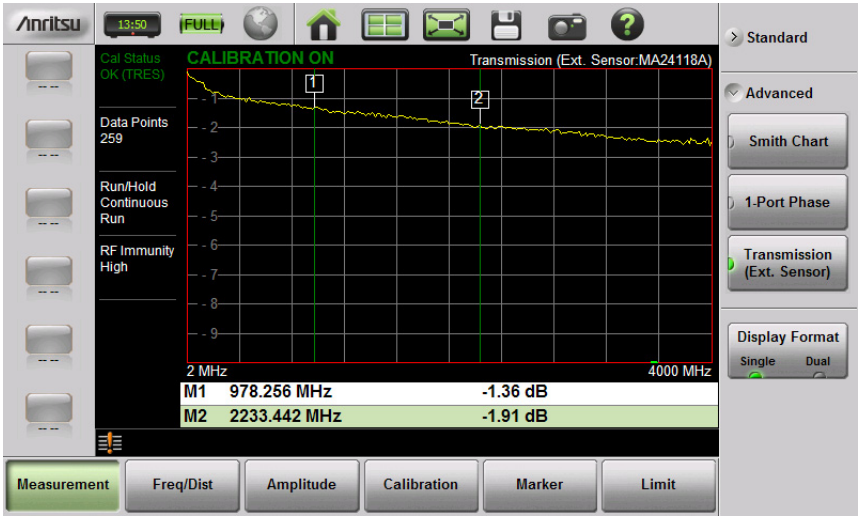


Figure 3-22. External Sensor Transmission Measurement

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.

3-6 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.

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

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

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

Setting the Amplitude using Fullscale

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

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

Refer to "Amplitude Menu" on page 3-57 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 3-64 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

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

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

Sweep Type

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

1. Press the **Sweep** (3) menu key.
2. Press Sweep Type to switch 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 settings. Pressing either the **Limit** (6) key or the **Limit** main menu key displays the Limit menu.

Overview of limit lines:

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

Limit Line Functions

1. Press **Limit** (6), then press the Active Limit key (if necessary) to choose Upper or Lower, 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 single or 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, then choose to Add, Edit, or Delete the segment. For editing purposes, consider a single, full-span limit line as a single segment. Press the Close submenu key or the **ESC** key to close the Segments submenu and return to the Limit menu.

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

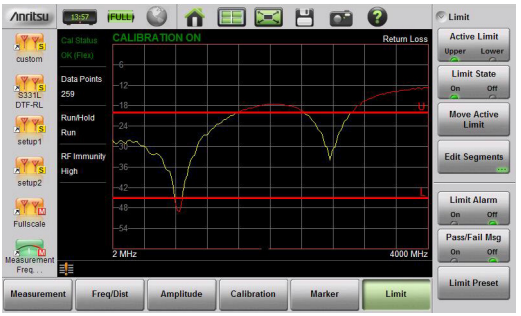


Figure 3-23. Limit Lines and Trace Showing Fail Colors

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

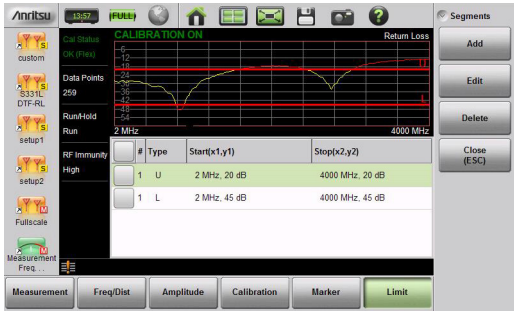


Figure 3-24. Table of Limit Lines (or Segments)

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

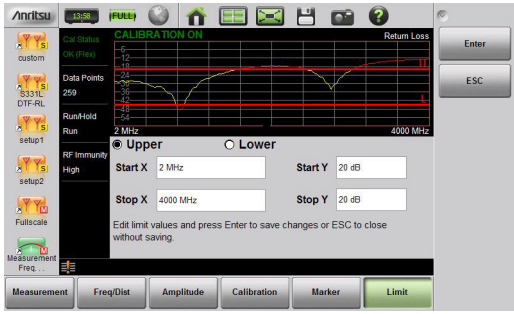


Figure 3-25. Segment Editing Dialog Box

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



Figure 3-26. Creating Limit Line Segments

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

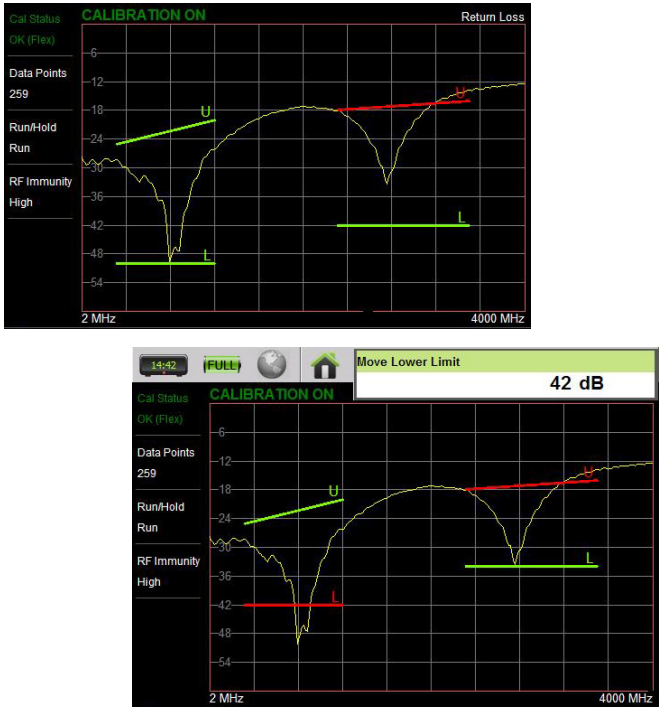


Figure 3-27. Moving Limit Line Segments

Limit Alarm

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.

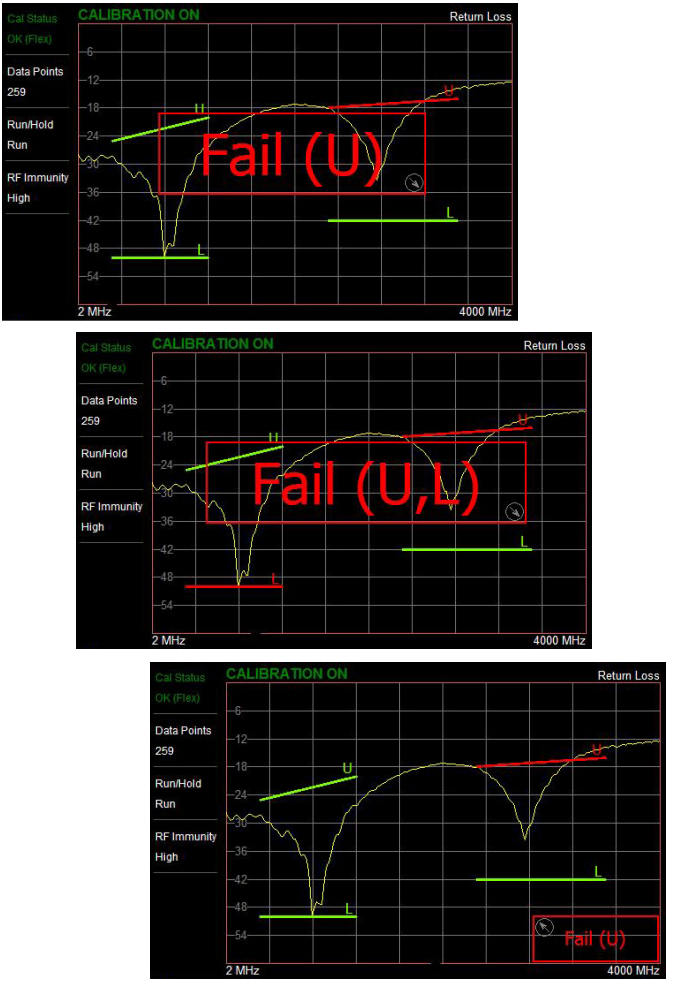


Figure 3-28. Pass/Fail Message Turned On

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.

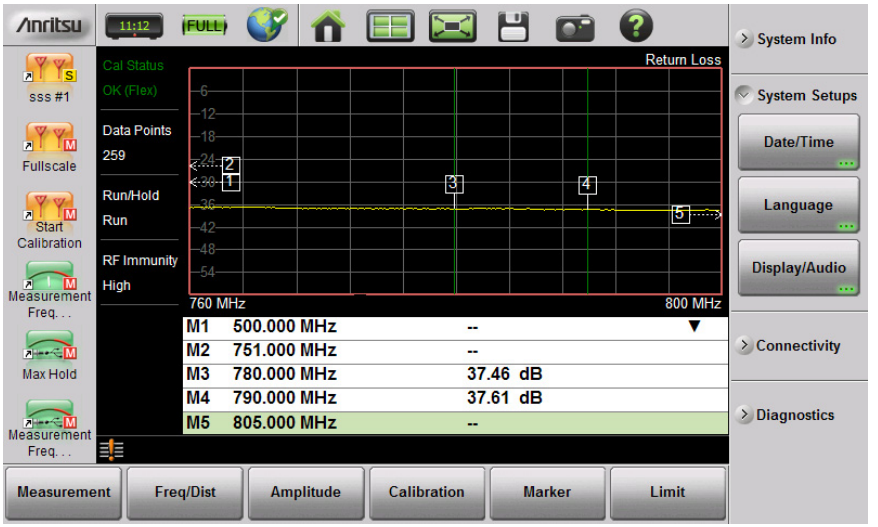


Figure 3-29. Markers 1, 2, and 5 are Out of Range

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. Figure 3-30 on page 3-39 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.

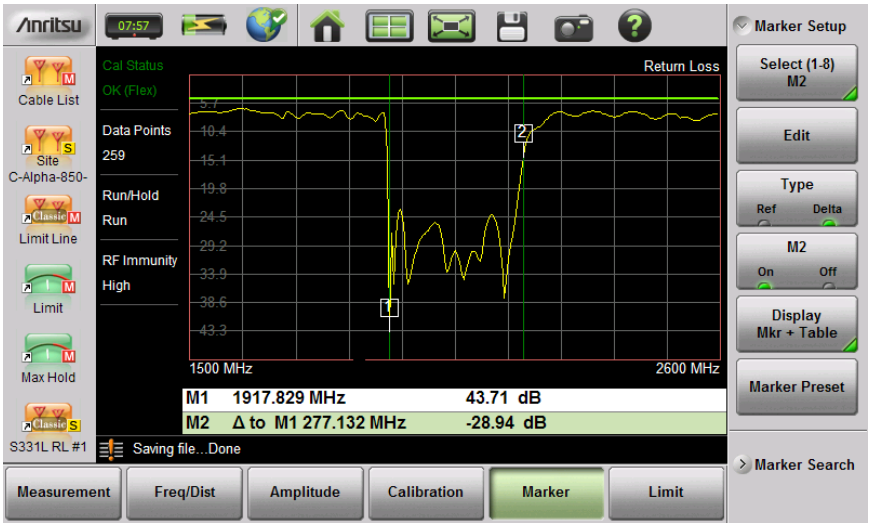


Figure 3-30. Delta Marker 2 and Marker Table

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.

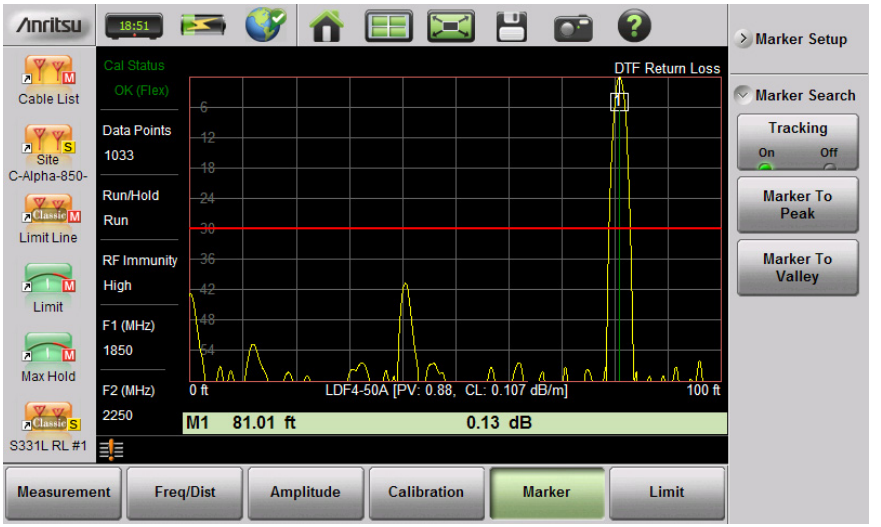


Figure 3-31. Marker Search, Marker 1 Set to Peak

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 3-38 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 3-41, 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.

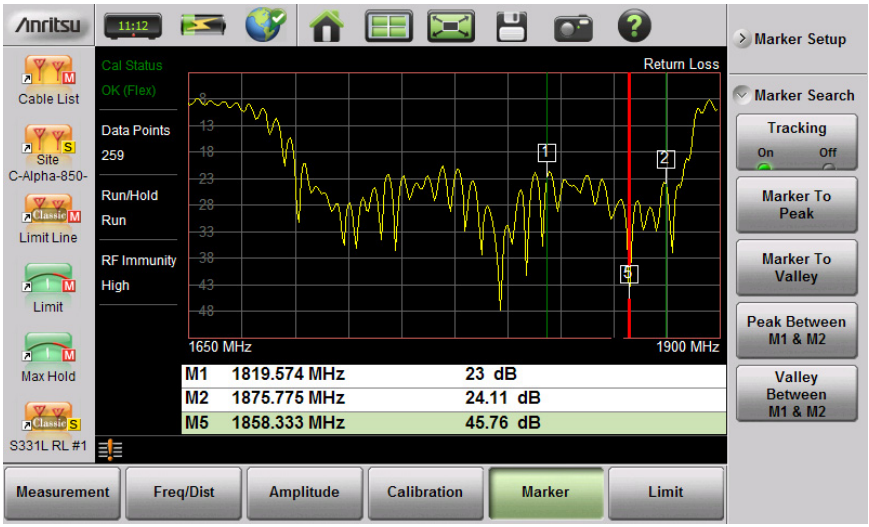


Figure 3-32. Bounded Marker Search

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.

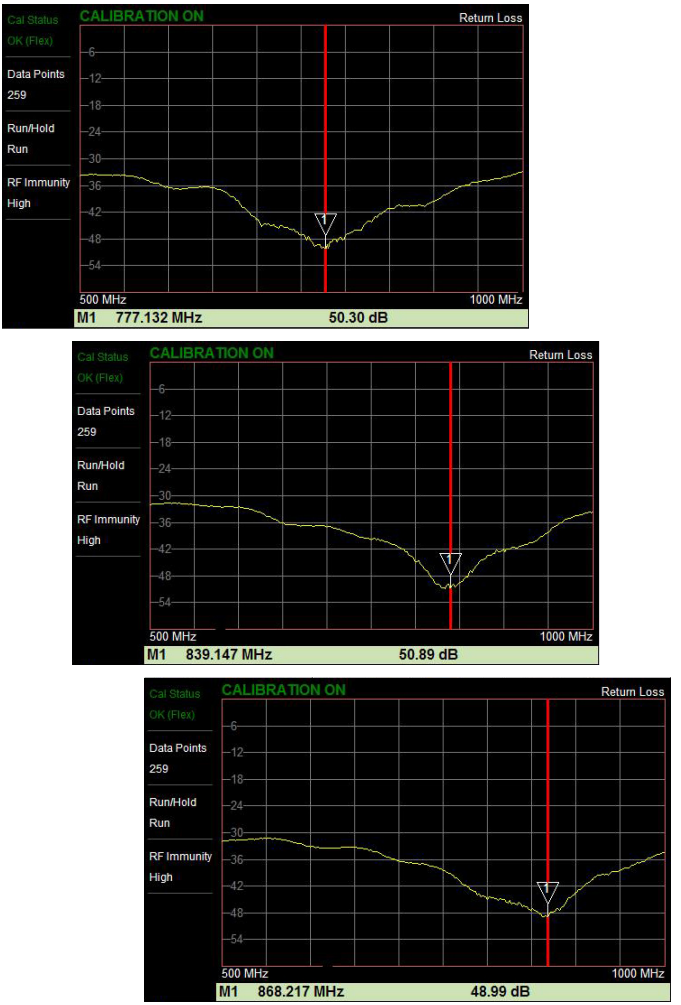


Figure 3-33. Tracking Marker Set to Valley

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.

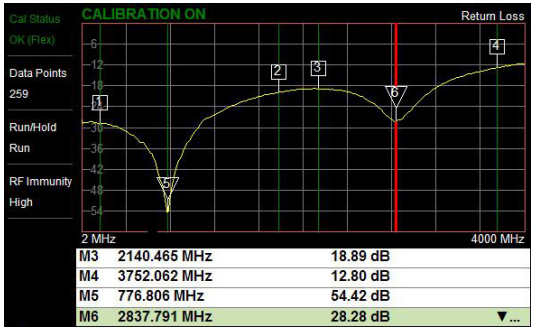


Figure 3-34. Tracking a Valley Between Markers

3-7 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.

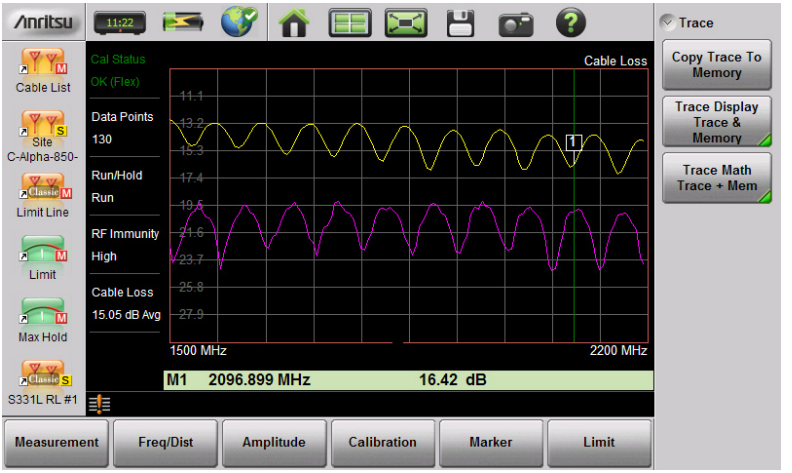


Figure 3-35. Displaying a Live Trace and a Static Trace from Trace Memory

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 3-28 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.

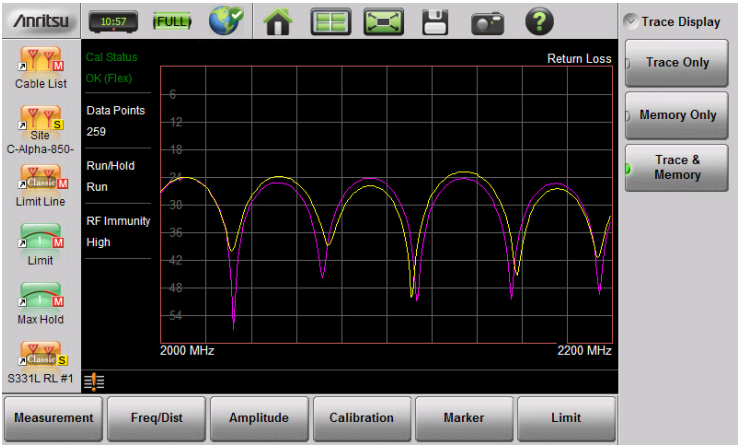


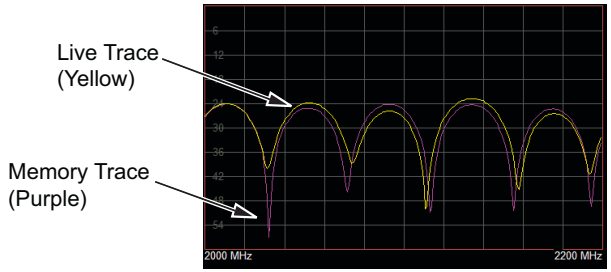
Figure 3-36. Trace Overlay of Two Cables

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.

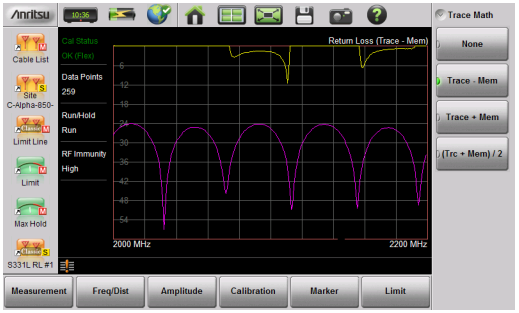
Trace Math Example

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

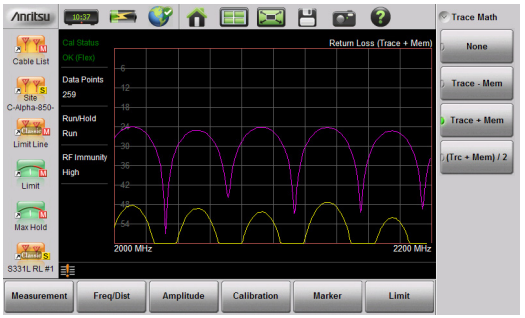
1. Complete the steps described in "Trace Overlay" on page 3-45.
2. Press Trace Math and select Trace - Mem , Trace + Mem, or (Trc + Mem) / 2 (Figure 3-37).



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

Notes

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

- 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 3-65 for additional information.

3-8 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

3-9 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.

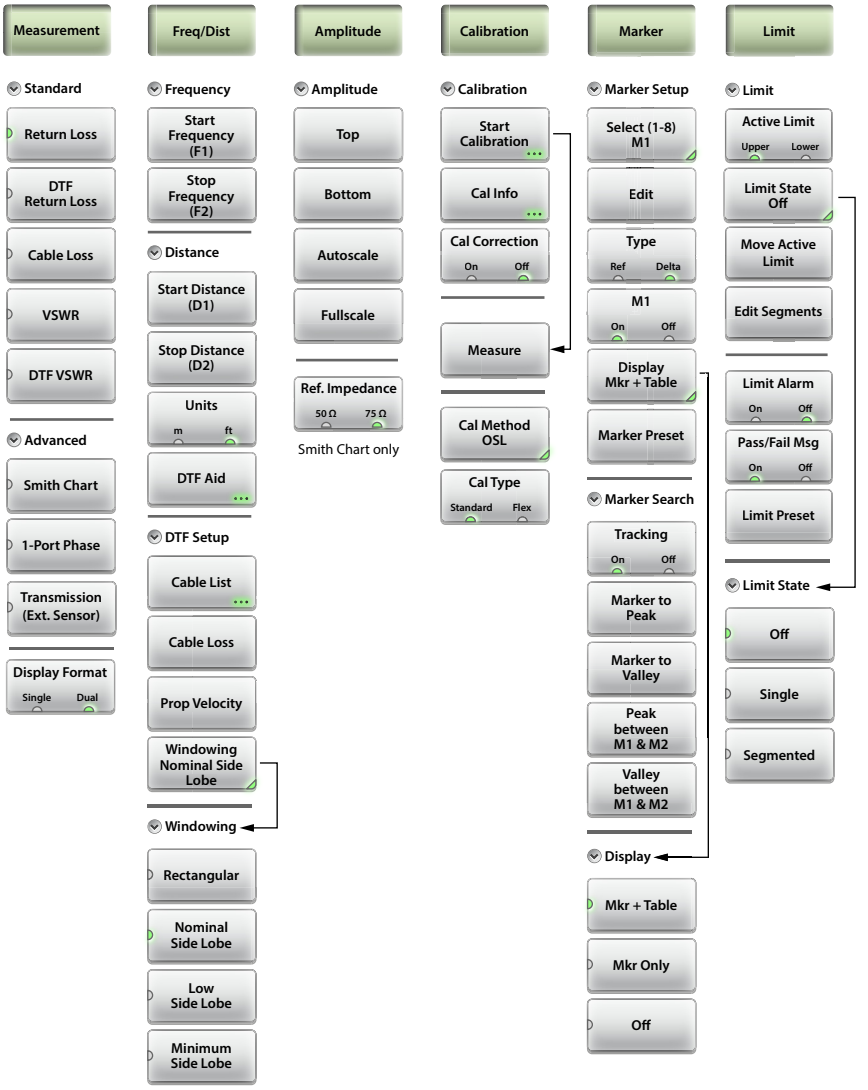


Figure 3-38. Menu Keys (1 of 2)

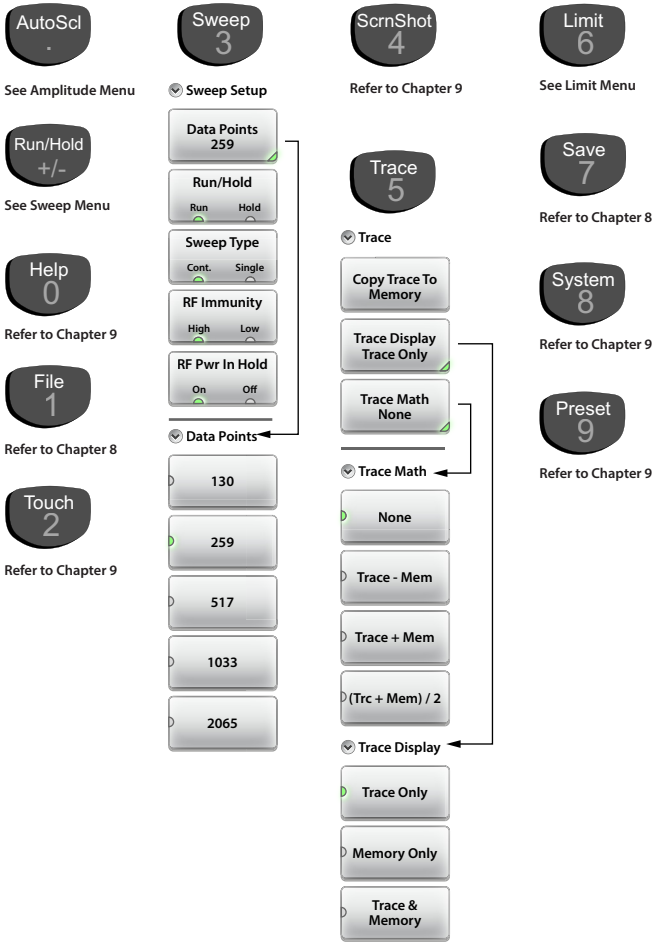


Figure 3-39. Main Menu Keys (2 of 2)

3-10 Measurement Menu

Key Sequence: **Measurement**



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)



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.

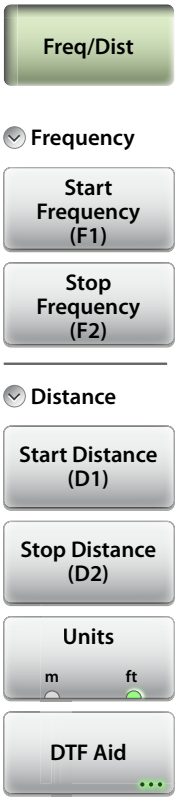
Common:

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)

3-11 Freq/Dist Menu

Key Sequence: **Freq/Dist**



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.

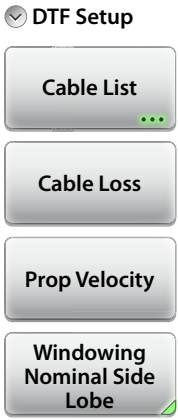
Units: Press the Units key to toggle distance units between meters and feet.

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

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.

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.

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**.

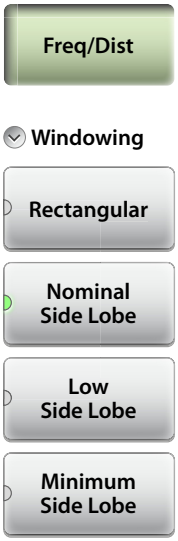
Prop Velocity: Press the Prop Velocity submenu key and enter the applicable propagation velocity for the selected cable using the keypad, **Up/Down** arrow keys, or the rotary knob and press **Enter**.

Windowing: Opens the "Windowing Menu" on page 3-56.

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

Windowing Menu

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



Rectangular: Rectangular Windowing shows the highest side lobe levels (worst) and the greatest main lobe resolution (best).

Nominal Side Lobe: Nominal Side Lobe Windowing shows less side lobe levels than Rectangular Windowing (good) but lower main lobe resolution (very good).

Low Side Lobe: Low Side Lobe Windowing shows less side lobe levels than Nominal Windowing (very good) but lower main lobe resolution (good).

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

3-12 Amplitude Menu

Key Sequence: **Amplitude**



Top: Sets the top amplitude value using the keypad, the arrow keys, or the rotary knob. Press **Enter** to complete the entry.

Bottom: Sets the bottom amplitude value using the keypad, the arrow keys, or the rotary knob. Press **Enter** to complete the entry.

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.

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.

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

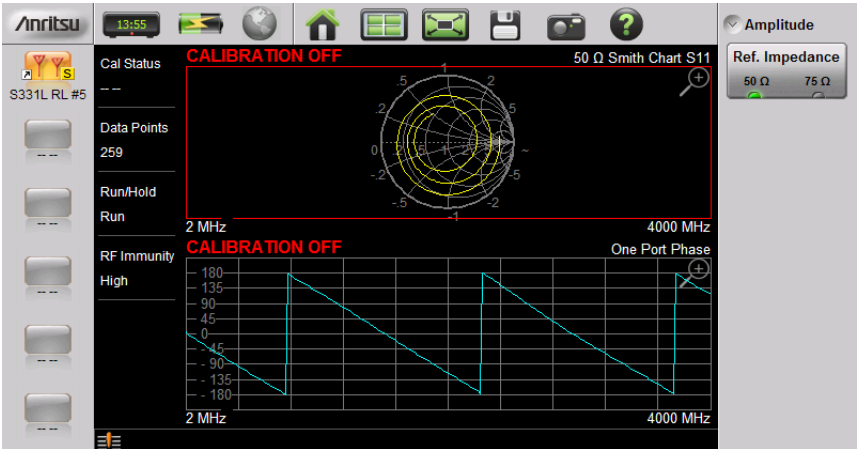
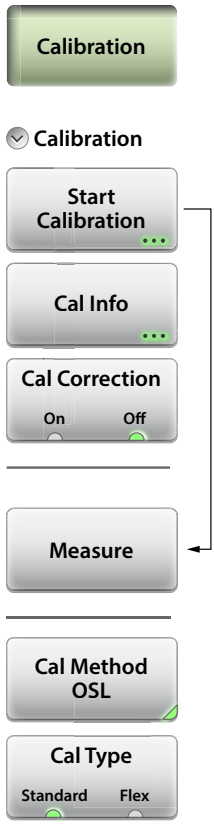


Figure 3-46. Set Reference Impedance for Smith Chart Measurement

3-13 Calibration Menu

Key Sequence: **Calibration**



Start Calibration: Opens the Calibration dialog box. Refer to Chapter 7, "Calibration" for detailed information.

Cal Info: Displays the Calibration Information table showing the current and active calibration settings.

Cal Correction: Turn Cal Correction On to apply the correction factor to the current measurement.

Measure: Starts the calibrations process. Follow the on screen instructions.

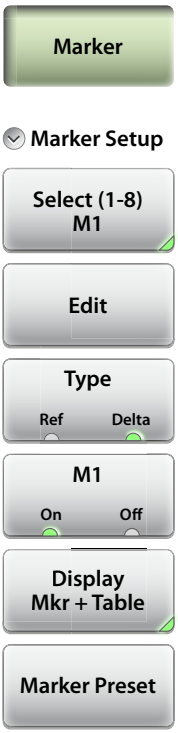
Cal Method: Selects one of the available calibration methods: OSL, InstaCal, Transmission (Ext. Sensor), or OSL + Transmission (Ext. Sensor).

Cal Type: Toggles between Standard (fixed frequency range) calibration and Flex (full frequency range) calibration.

Figure 3-47. Calibration Menu

3-14 Marker Menu

Key Sequence: **Marker**



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): 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)

3-15 Limit Menu

Limit lines can be used for visual reference only, or for pass/fail criteria using the limit alarm and Pass/Fail Message keys. Limit alarm failures are reported whenever a signal crosses the limit line.

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



Limit

Active Limit (Upper Lower): This key toggles the active limit line settings to the Upper or Lower 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 3-63. Limit line amplitude is stored even when turned off.

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.

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.

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 3-63.

Limit Alarm (On Off): When turned On, the Limit Alarm sounds a repeating beep when the trace touches the limit line.

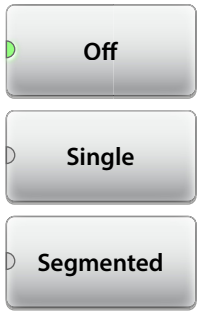
Pass/Fail Msg (On Off): When turned On, a Pass or Fail message is displayed to indicate whether the trace touches or exceeds the limit line (Fail).

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

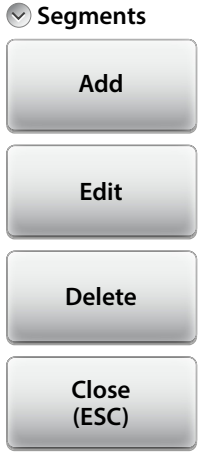
Off: The limit line state is set to off.

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



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

3-16 Sweep Menu

Key Sequence: **Sweep** (3)



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.

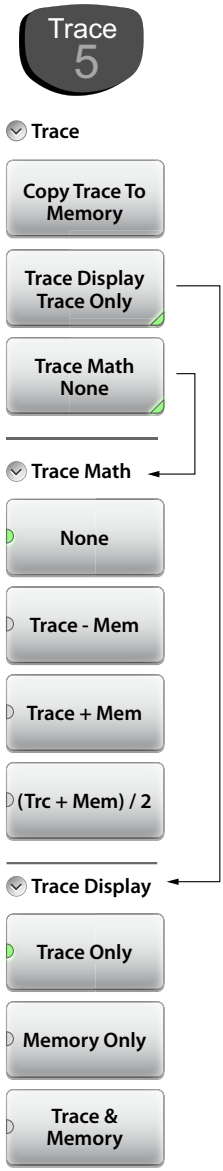
RF Immunity, High / Low: The instrument defaults to RF Immunity High and is the suggested setting. See “RF Immunity” on page 3-30 for details.

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 3-30 for details.

Figure 3-53. Sweep Menu

3-17 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

3-18 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.

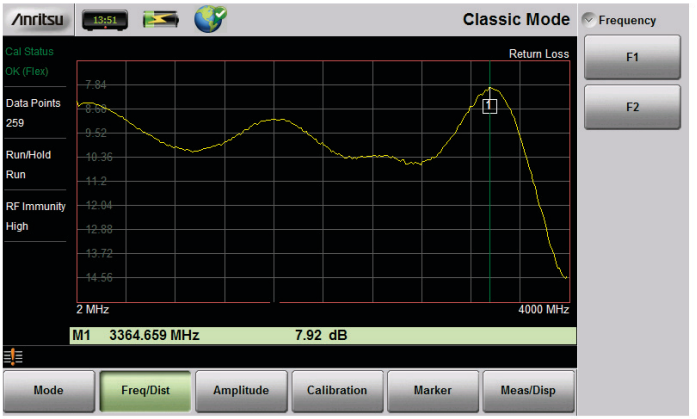
The primary purpose of Classic Mode is to help users of the S331L follow existing carrier's Method of Procedure (MOP) documents while they become more familiar with the instrument. There are many additional features and capabilities in Advanced Mode that make the transition well worth the time to learn its intuitive operation.

Figure 4-1 on page 4-2 illustrates the Site Master S331L screen display in Classic mode versus Advanced mode.

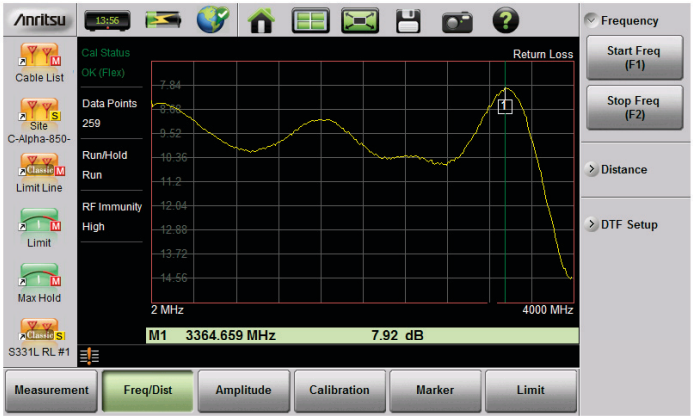
Note	Use the **Menu** key and confirm that the instrument is in Classic Cable & Antenna Analyzer mode before continuing. **Classic Mode** will always be displayed above the measurement type when the instrument is in Classic mode.

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 3-52
Freq - SWR	"VSWR" on page 3-52
Freq - Return Loss	"Return Loss" on page 3-52
Freq - Cable Loss (one port)	"Cable Loss" on page 3-52
DTF - SWR	"DTF VSWR" on page 3-52
DTF - Return Loss	"DTF Return Loss" on page 3-52
–	"Smith Chart" on page 3-53
–	"1-Port Phase" on page 3-53
Freq/Dist Menu	"Freq/Dist Menu" on page 3-54
F1	"Start Frequency (F1)" on page 3-54
F2	"Stop Frequency (F2)" on page 3-54
D1	"Start Distance (D1)" on page 3-54
D2	"Stop Distance (D2)" on page 3-54
More	"DTF Setup" on page 3-55
Meas/Disp Menu	Refer to "Sweep Menu" on page 3-64 and "Trace Menu" on page 3-65
Marker Menu	
"Marker Menu" on page 4-6	"Marker Menu" on page 3-60
Limit Menu	
"Limit Menu" on page 4-8	"Limit Menu" on page 3-62

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.

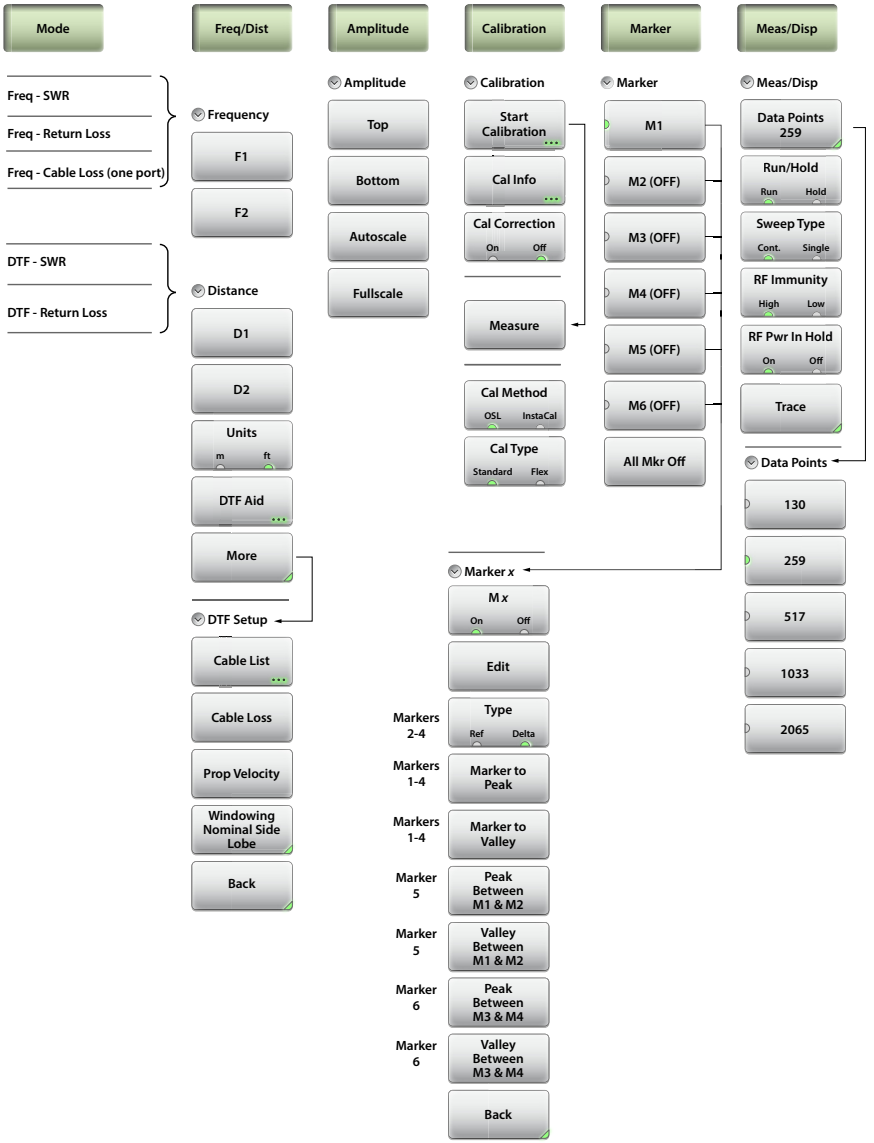


Figure 4-2. Classic Mode Menu Keys (1 of 2)

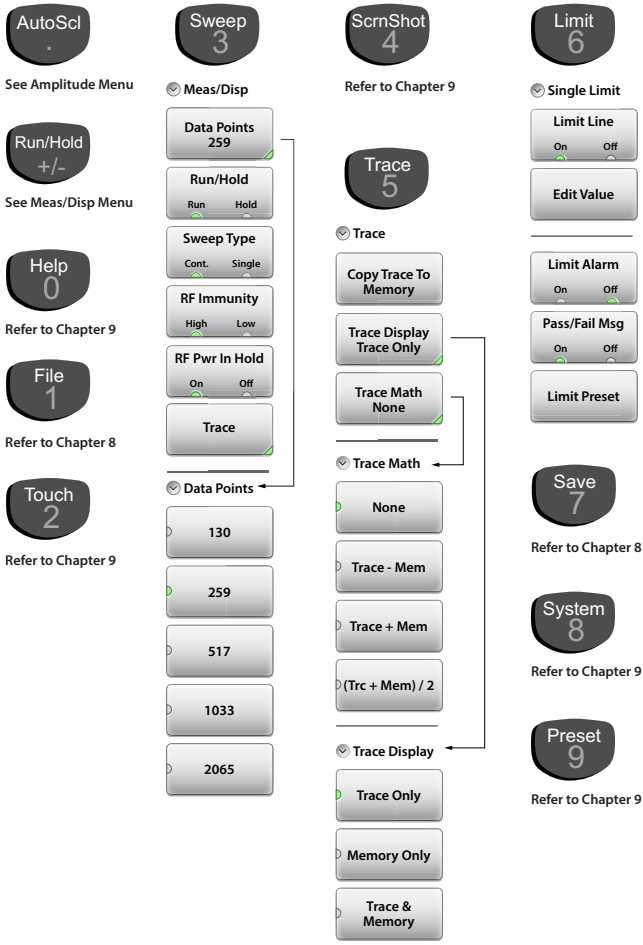


Figure 4-3. Classic Mode Menu Keys (2 of 2)

4-2 Marker Menu

Key Sequence: **Marker**



Marker

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.

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.

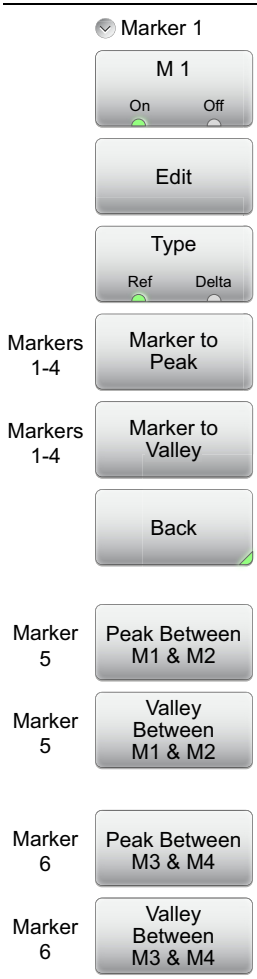
Submenu keys M2 through M6 behave in the same manner as M1.

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

M 1 (On Off): Press this key to turn OFF the selected marker (M1 to M6).

Edit: Press this key to enter a marker value.

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.

Marker to Peak: Press this key to set a Marker (M1 to M4 only) on the highest signal amplitude in the displayed trace.

Marker to Valley: Press this key to set a Marker (M1 to M4 only) on the lowest signal amplitude in the displayed trace.

Back: Press this key to return to the Marker menu.

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.

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

When Marker 6 is Active

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

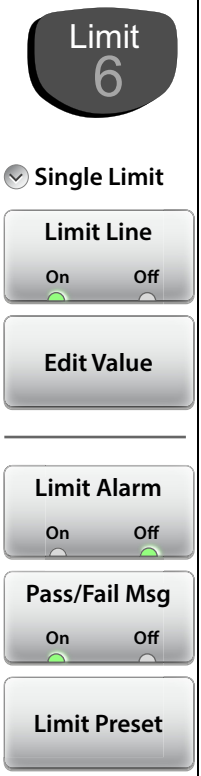
Valley Between M3 & M4: Places Marker 6 on the lowest signal amplitude between Marker 3 and Marker 4.

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)



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

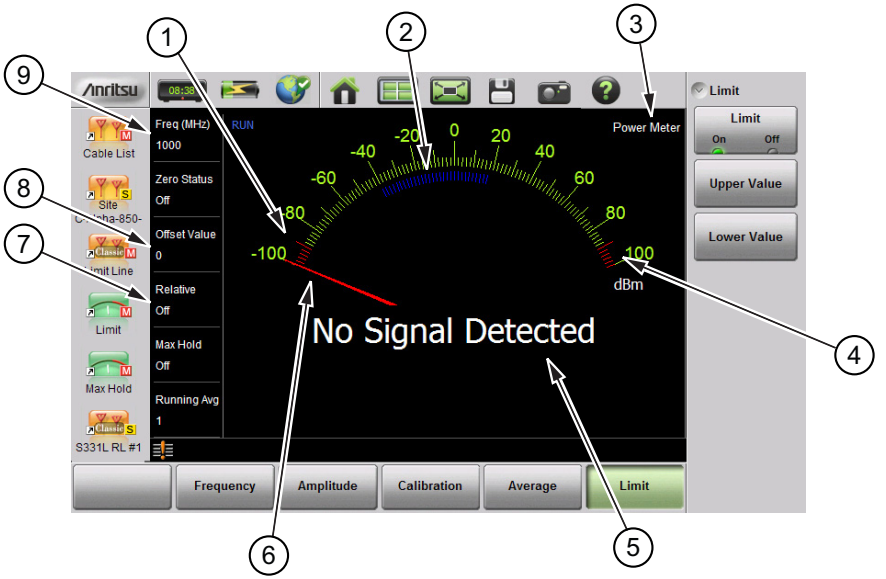
5-1 Overview

This chapter provides an overview of power meter measurements and how to set up 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.



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

Figure 5-1. Power Meter Display Overview

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.

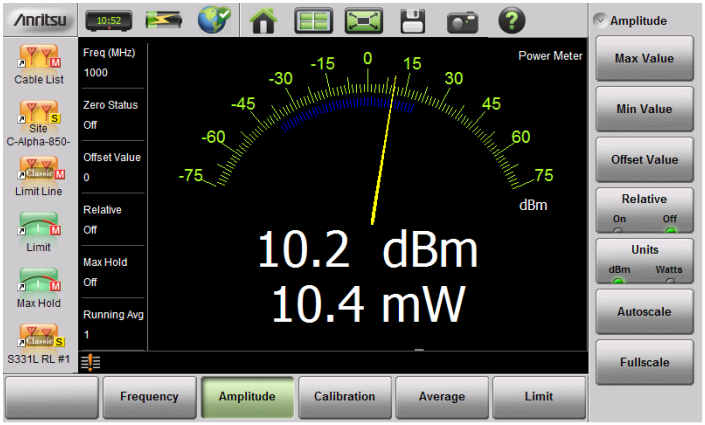
Setting the Amplitude

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.

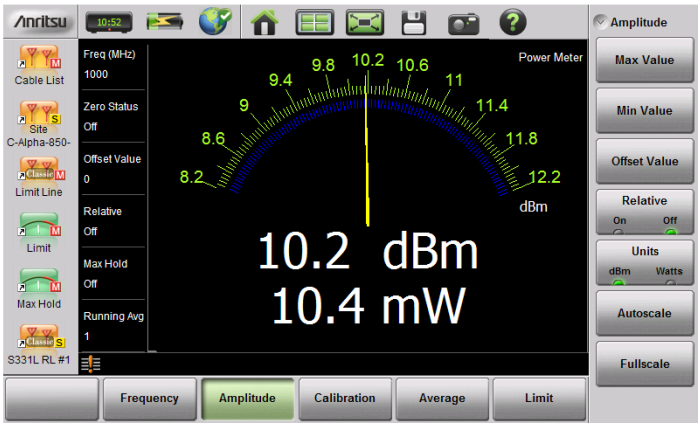
1. Press the **Amplitude** main menu key.
2. Press the Max Value submenu key and set the upper scale value. Press the Min Value submenu key and set the lower scale value.

   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

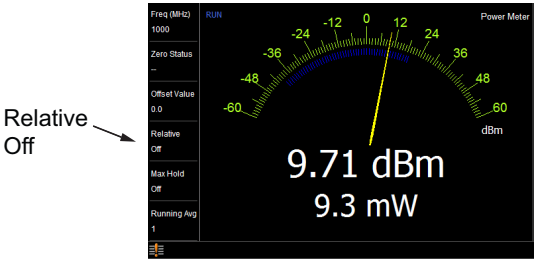
The power meter scale can be displayed in dBm or Watts. Use the following procedure to change the displayed units:

1. Press the **Amplitude** main menu key.
2. Press the Units submenu key and select the display units.

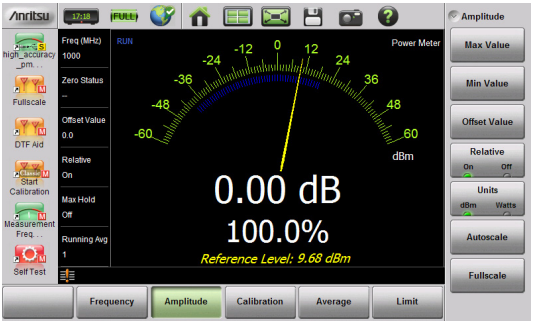
Displaying Relative Power

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

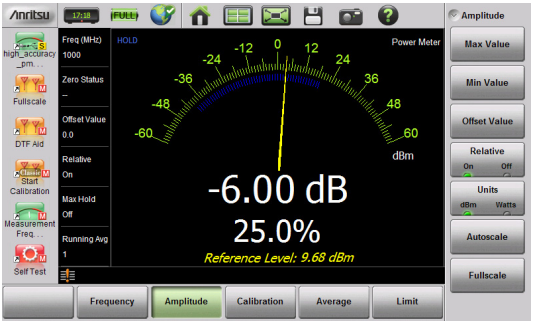
1. With the desired base power (reference) level connected to the input of your instrument, press the **Amplitude** main menu key.
2. Press the Relative submenu key. Note that the absolute value of the measurement at the time the Relative key is pressed is shown in yellow below the numerical display (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



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.

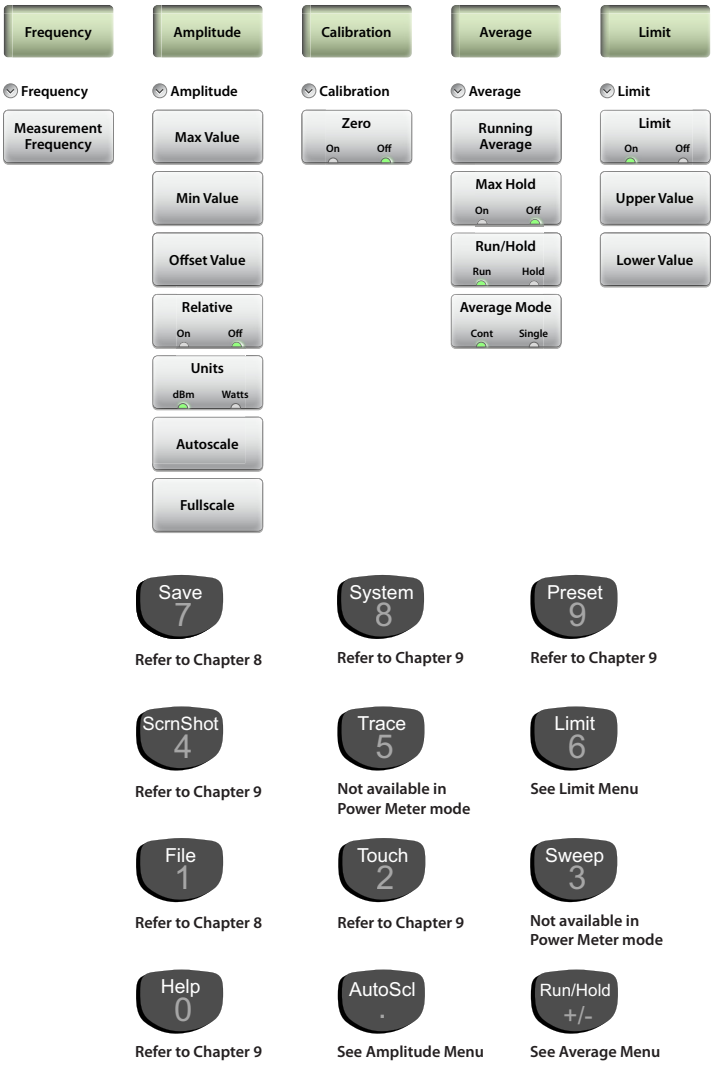
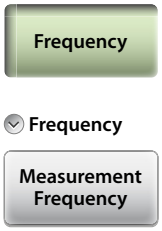


Figure 5-6. Power Meter Menus

5-5 Frequency Menu

Key Sequence: **Frequency**



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**



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**

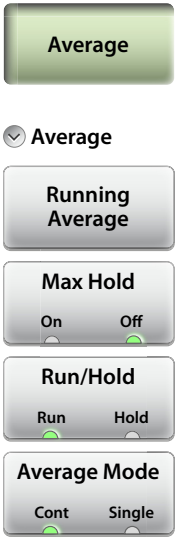


Zero On Off: Toggles the zero calibration On or Off to remove noise or interference power. Refer to "Calibration" on page 5-9 for additional information.

Figure 5-9. Power Meter Calibration Menu

5-8 Average Menu

Key Sequence: **Average**



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.

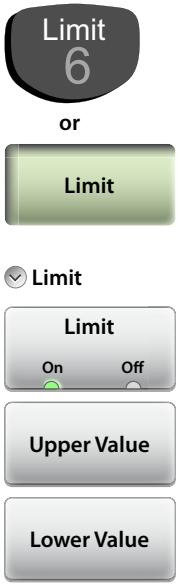
Run/Hold: Toggles between Run and Hold. When in Hold mode, pressing this key starts the measurement and provides a trigger. When in the Run mode, pressing this key pauses the sweep.

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: 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 set up 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.

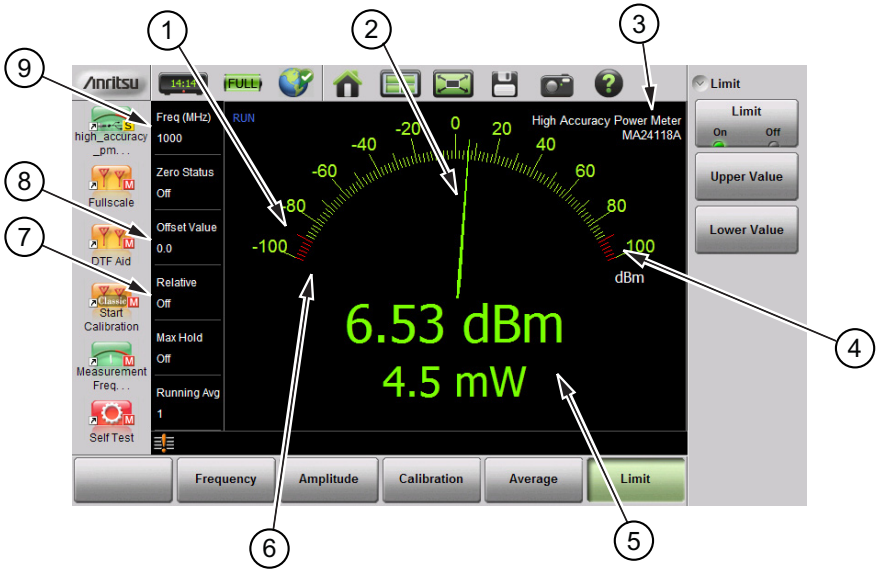
- Forward Measurements: Average Power, Crest Factor, Burst Average Power, Peak Envelope Power (PEP), and CCDF.
- Reverse Measurements: Average Power, Reflection Coefficient, Return Loss, and VSWR.

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

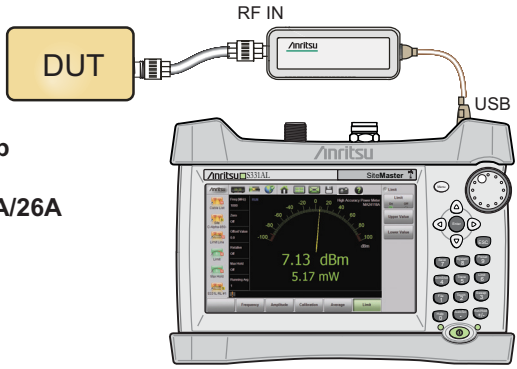
Figure 6-1. Power Meter Display Overview

6-3 General Measurement Setup

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

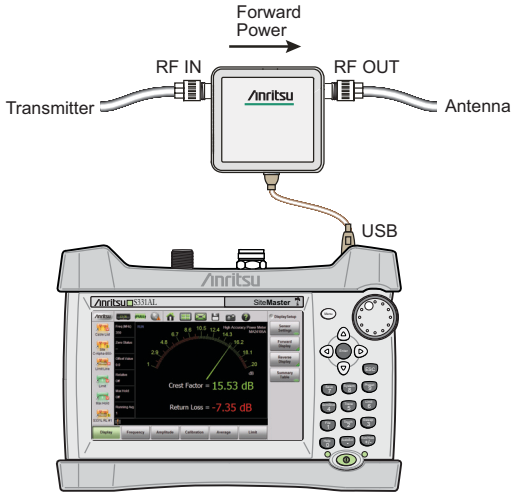
Connection

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.

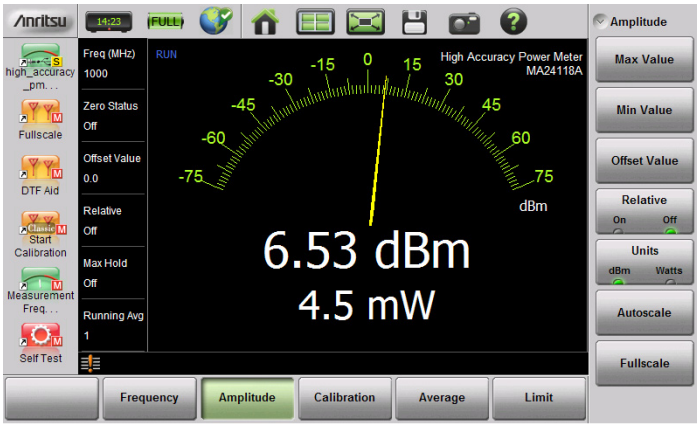
Setting the Amplitude

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.

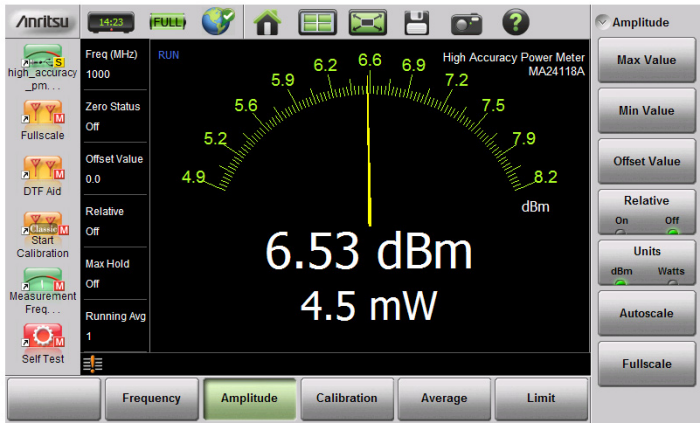
1. Press the **Amplitude** main menu key.
2. Press the Max Value submenu key and set the upper scale value. Press the Min Value submenu key and set the lower scale value.

   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

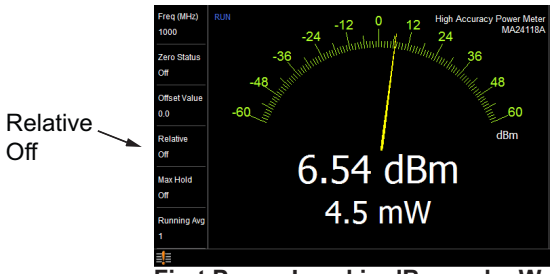
The power meter scale can be displayed in dBm or Watts. Use the following procedure to change the displayed units:

1. Press the **Amplitude** main menu key.
2. Press the Units submenu key and select the display units.

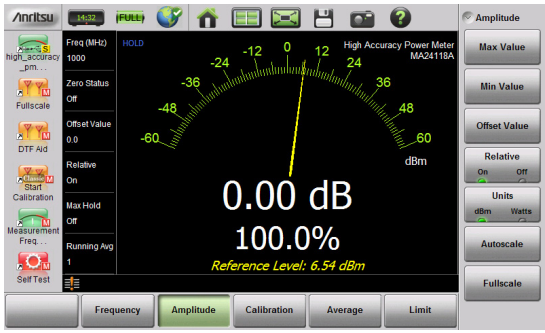
Displaying Relative Power

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

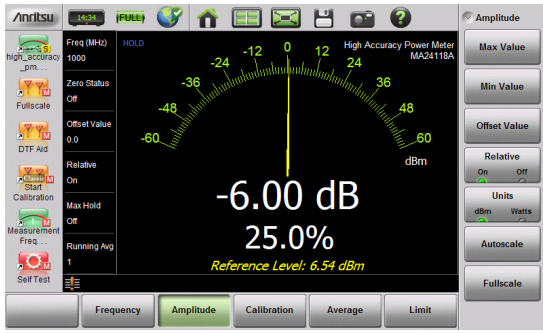
1. With the desired base power (reference) level connected to the USB sensor, press the **Amplitude** main menu key.
2. Press the Relative submenu key. Note that the absolute value of the measurement at the time the Relative key is pressed is shown in yellow below the numerical display (see Figure 6-4 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

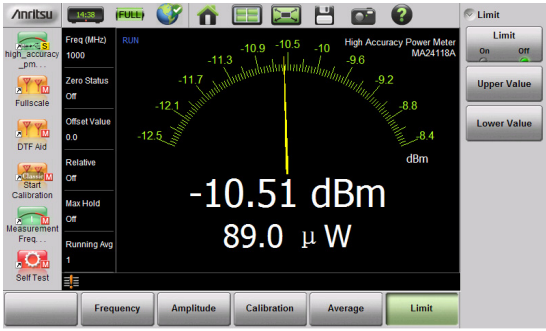
Maximum and minimum limits can be set as follows:

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**.

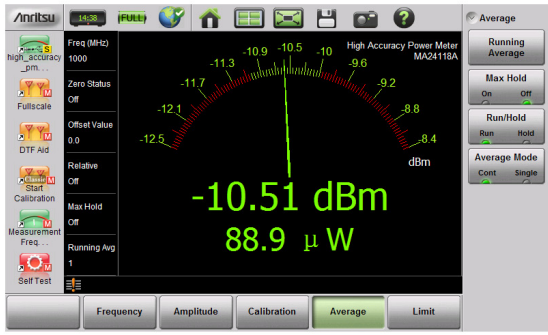
The needle color and color of the numeric power level displayed below the graph change based on the current limit settings:

- 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.

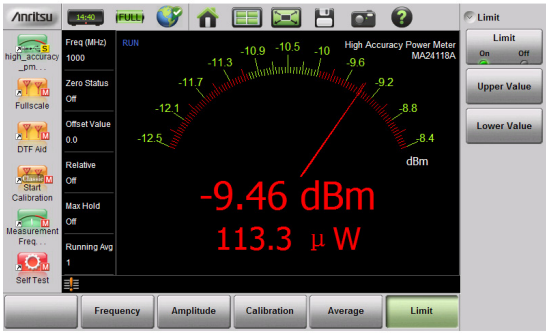
Refer to Figure 6-5 on page 6-9 for examples of each condition.



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 6-26.

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

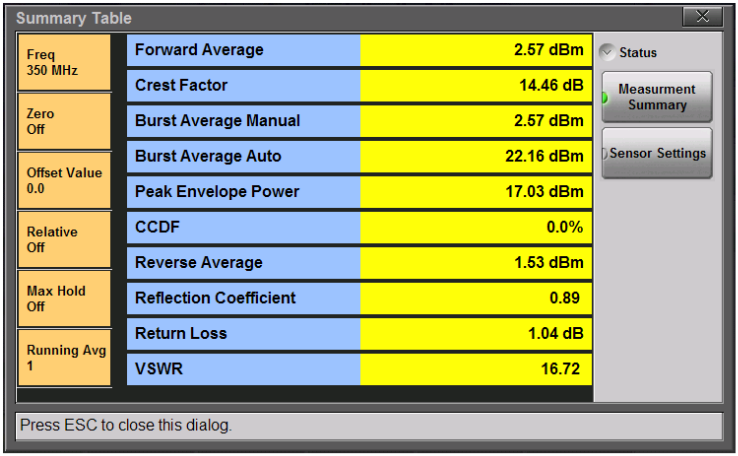


Figure 6-7. Summary Table View

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.

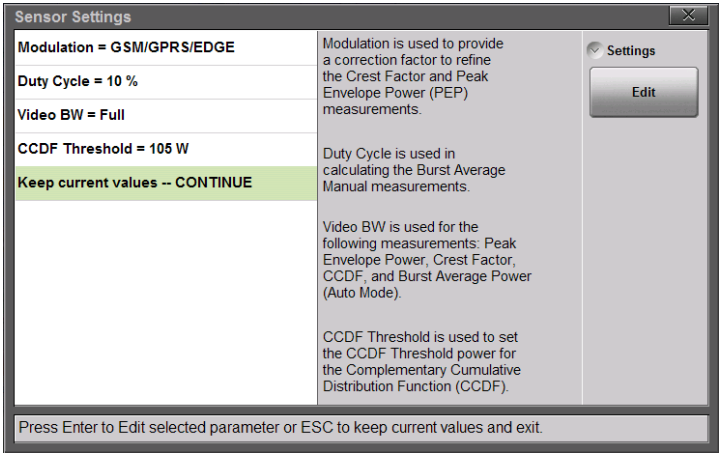


Figure 6-8. Sensor Settings

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.

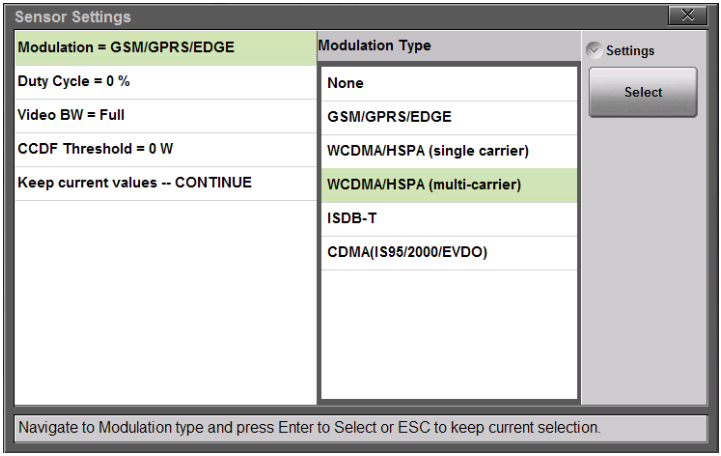


Figure 6-9. Sensor Settings

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.

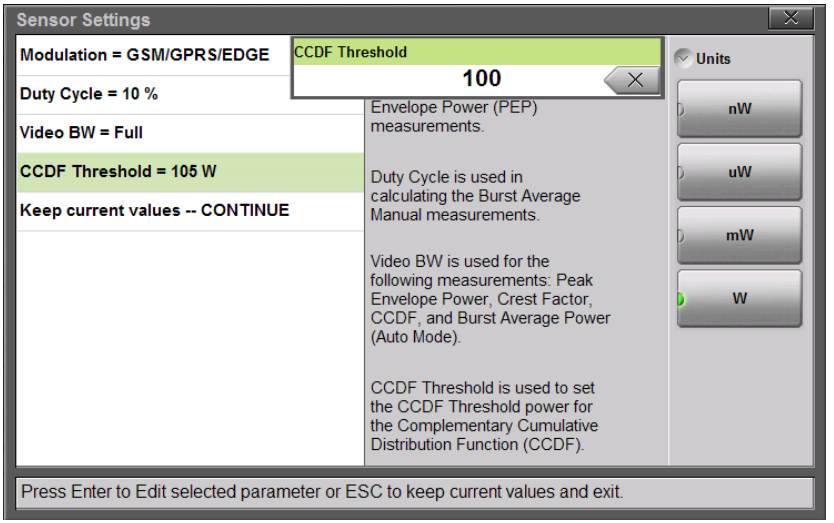
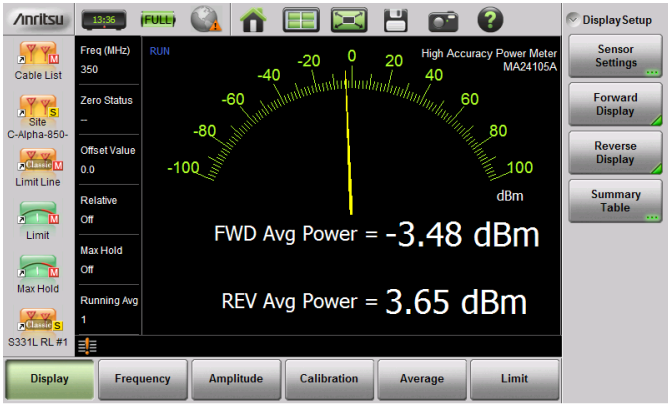


Figure 6-10. CCDF Threshold

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 6-28 and "Reverse Menu" on page 6-29 for additional information.



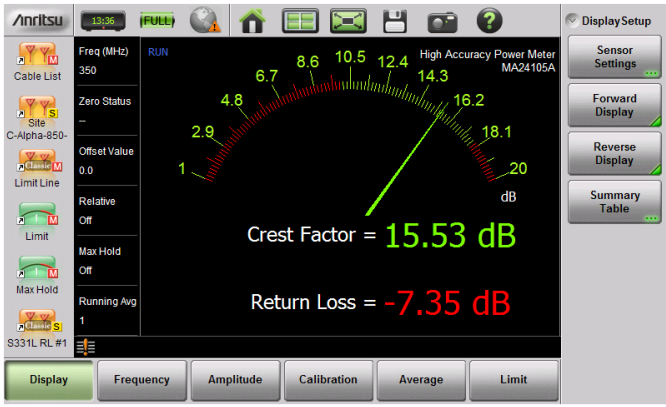


Figure 6-11. Forward and Reverse Measurement Combinations

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).

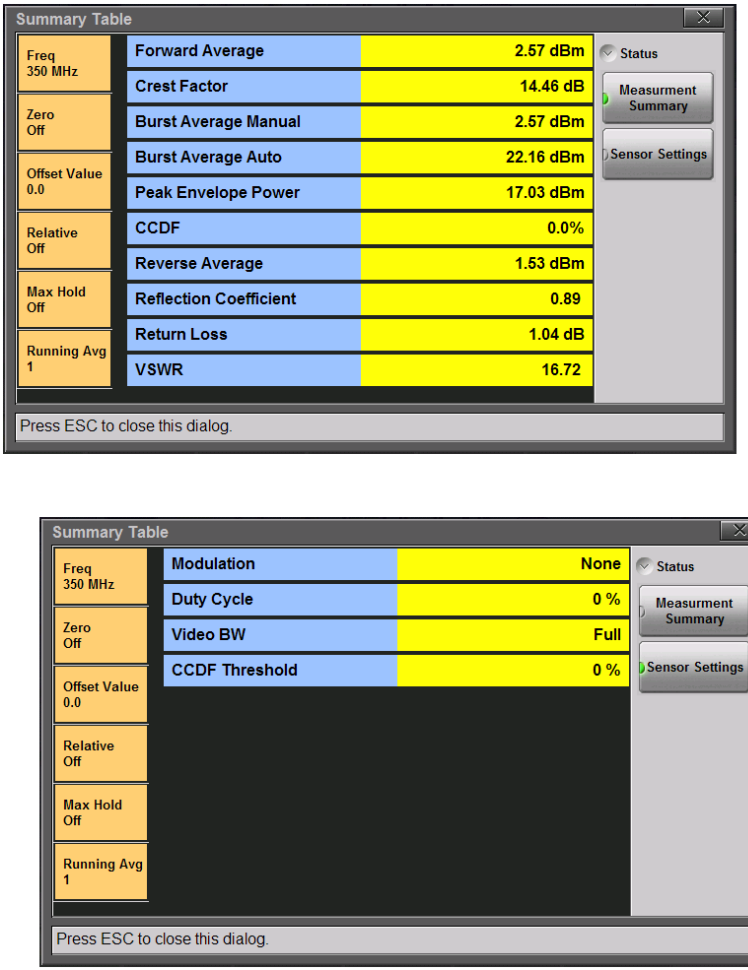


Figure 6-12. Summary Table

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.

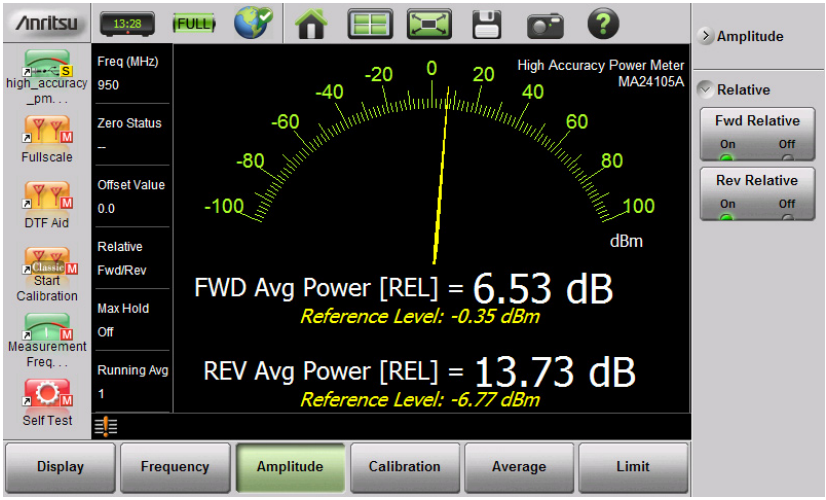


Figure 6-13. Forward and Reverse Relative Power

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 6-26

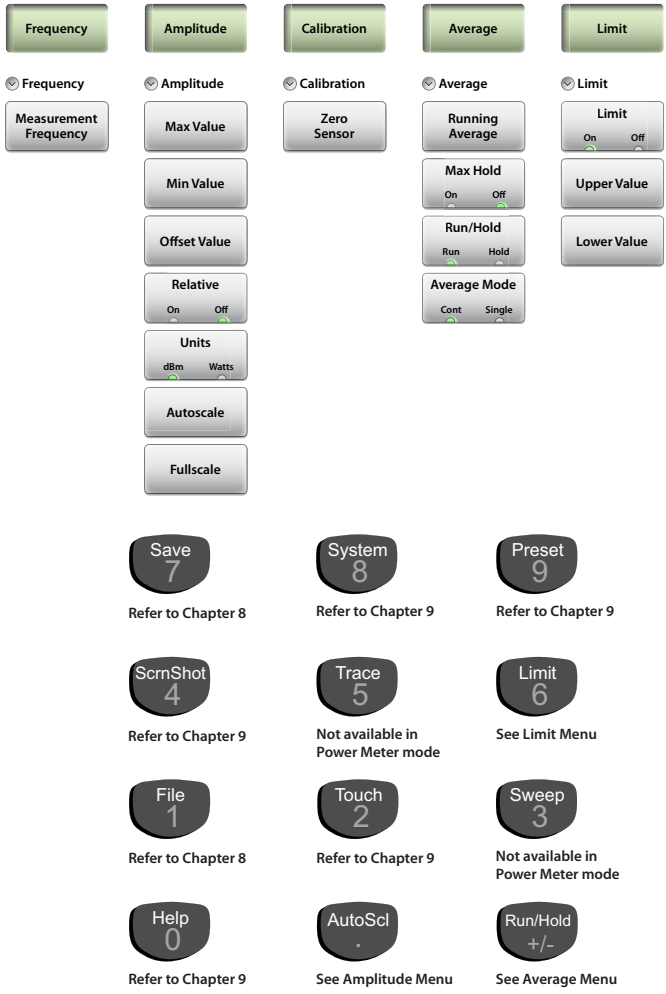
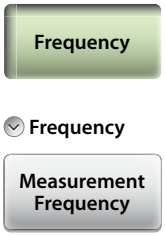


Figure 6-15. High Accuracy Power Meter Menus

6-6 Frequency Menu

Key Sequence: **Frequency**

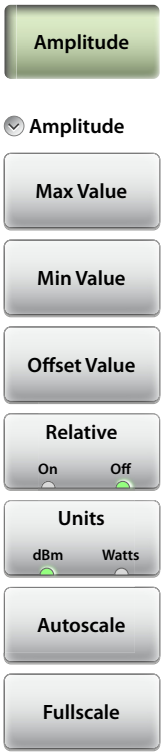


Measurement Frequency: Sets the frequency at the center of the measurement. Frequencies can be entered using the keypad and then selecting a unit (GHz, MHz, kHz, or Hz) submenu key or by using the rotary knob, or the **Up/Down** arrow keys and pressing **Enter** to set the frequency, or **Esc** to restore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

Figure 6-16. High Accuracy Power Meter Frequency Menu

6-7 Amplitude Menu

Key Sequence: **Amplitude**



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.

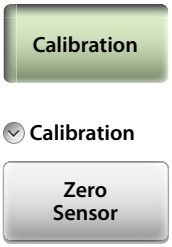
Autoscale: Adjusts the Top and Bottom values so that the power meter needle will be shown in the middle of the analog display.

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**

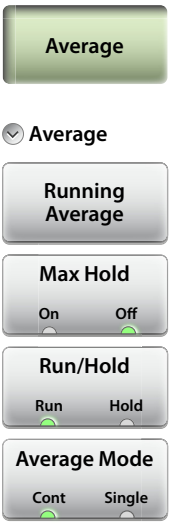


Zero Sensor: Initiates the zero calibration of the sensor. A message box is displayed with further instructions. Refer to "Calibration" on page 6-10 for additional information.

Figure 6-18. High Accuracy Power Meter Calibration Menu

6-9 Average Menu

Key Sequence: **Average**



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.

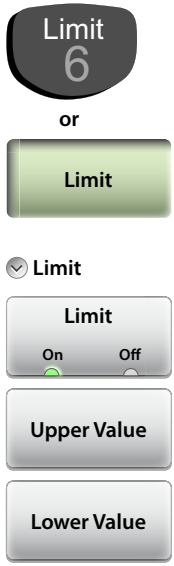
Run/Hold: Toggles between Run and Hold. When in Hold mode, pressing this key starts the measurements and provides a trigger. When in the Run mode, pressing this key pauses the sweep.

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.

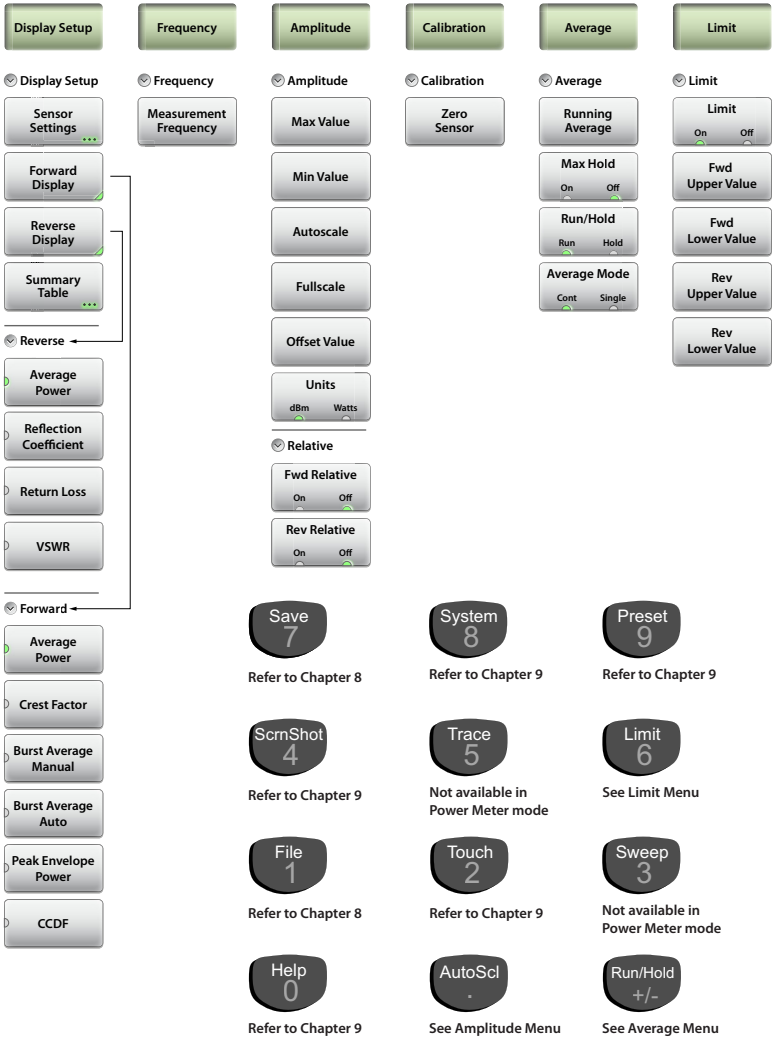


Figure 6-21. High Accuracy PM (MA24105A) Menus

6-12 Display Setup Menu

Key Sequence: **Display Setup**



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 6-28.

Reverse Display: Displays the reverse measurement options shown in "Reverse Menu" on page 6-29.

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



Average Power: Press this submenu key to have the sensor measure the average power in the forward direction.

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.

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 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: Press this submenu key to have the sensor measure the peak power in the forward direction.

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



Average Power: Press this submenu key to have the sensor measure the average power in the reverse direction.

Reflection Coefficient: Press this submenu key to measure the reflection coefficient:

Reflected Power / Forward Power

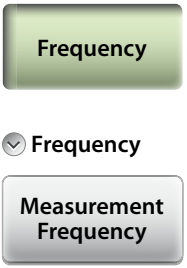
Return Loss: Press this submenu key to measure return loss, which is the measurement in dB of reflected energy caused by impedance mismatch. May also be referred to as S11.

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.

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

6-13 Frequency Menu

Key Sequence: **Frequency**

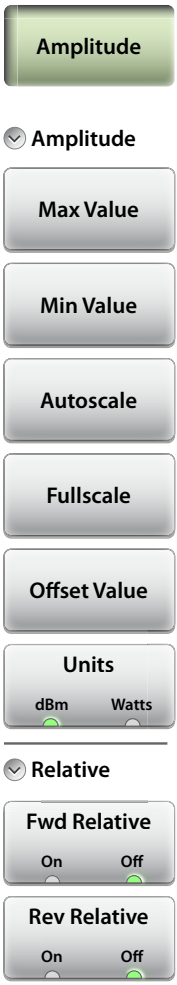


Measurement Frequency: Sets the frequency at the center of the measurement. Frequencies can be entered using the keypad and then selecting a unit (GHz, MHz, kHz, or Hz) submenu key or by using the rotary knob, or the **Up/Down** arrow keys and pressing **Enter** to set the frequency, or **Esc** to restore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

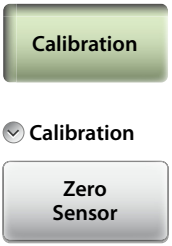
Rev Relative On Off: Press this submenu key to toggle On or Off. This measurement shows the relative level of the current reverse power level to the reverse power level when Rev Relative was turned on.

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**

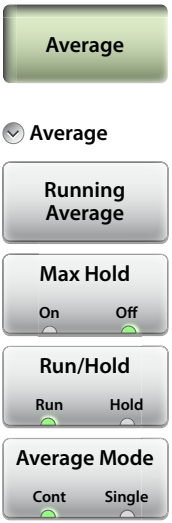


Zero Sensor: Initiates the zero calibration of the sensor. A message box is displayed with further instructions. Refer to "Calibration" on page 6-10 for additional information.

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

6-16 Average Menu

Key Sequence: **Average**



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: 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.

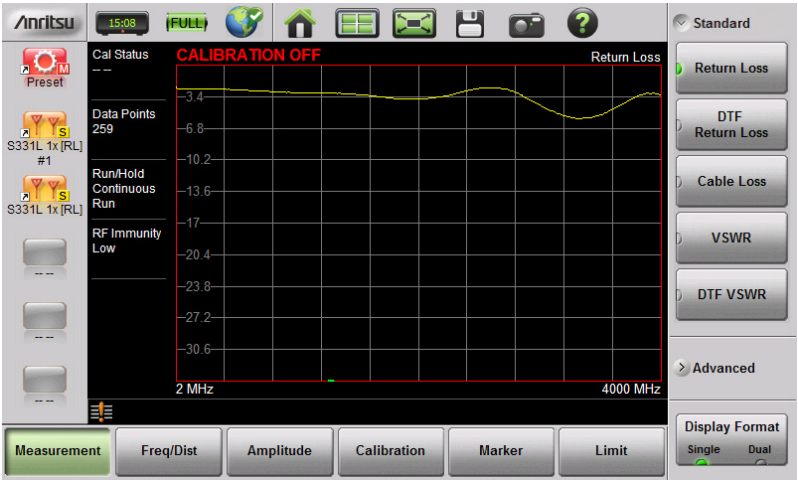
Chapter 7 — Calibration

7-1 Introduction

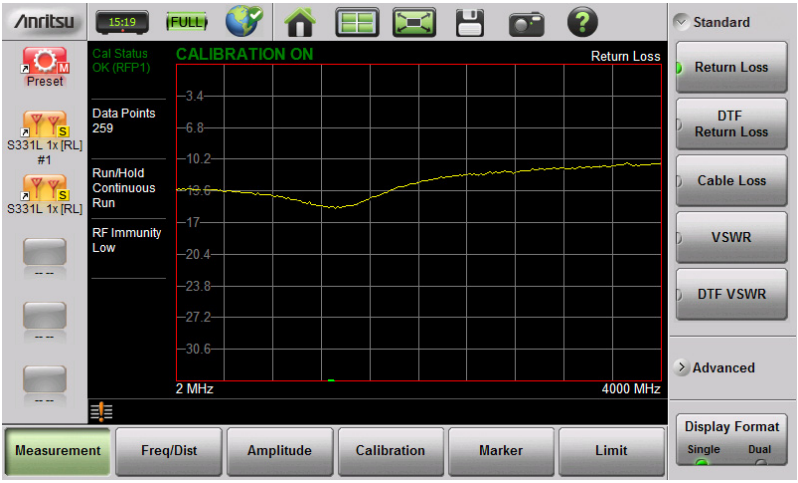
This chapter provides details and procedures for calibrating the Cable-Antenna Analyzer modes of the Site Master S331L. Topics include calibration options Internal InstaCal, External Open-Short-Load (OSL), Transmission using External Sensor, Standard Cal, and Flex Cal.

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



After Calibration

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 °C) or when the test port extension cable is removed or replaced. Unless the calibration type is Flex Cal, the instrument must also be re-calibrated every time the frequency range changes.

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 Flex Cal determines the calibration frequency range. The default standard calibration is for a selected frequency range, and is no longer valid if the frequency is changed. Flex Cal is a broadband frequency calibration that remains valid if the frequency is changed.

Flex Cal calibrates the instrument over the entire frequency range and interpolates data points if the frequency range is changed. This method saves time as it does not require the user to re-calibrate the system for frequency changes. The trade-off is that the accuracy is not the same (fewer data points) as it would be with the standard calibration. If the frequency range will not be changed often, standard calibration is recommended for troubleshooting purposes. Table 7-1 has a summary comparing the OSL and InstaCal methods for both Standard and Flex Cal settings.

Table 7-1. Summary of Calibration Methods and Tools

Calibration Type	Calibration Tool	
	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.
Flex Cal (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 Flex.
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.

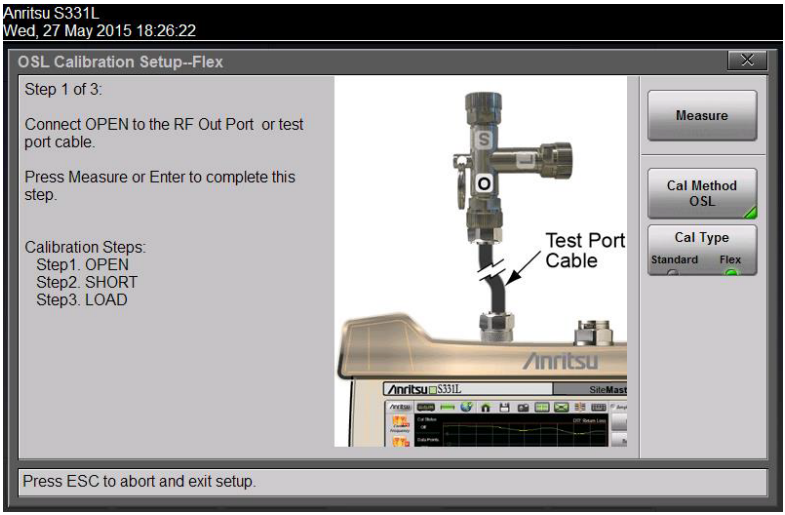


Figure 7-2. Calibration Setup OSL Cal

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.

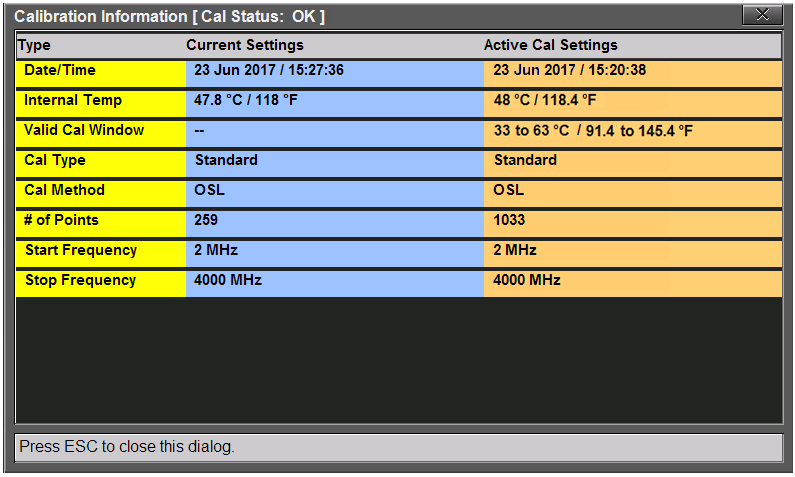


Figure 7-3. Calibration Information

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**



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 Flex Cal. 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 File menu and associated 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:

- File management functions apply to files stored in internal memory or on a removable disk.
- Select the destination for saved files using the Location button and the Set Location key in the Save dialog box.
- Rename saved files under the File Management menu (**File** > File Mgmnt).
- Sort files by tapping a column heading.
- Move up and down file lists using the buttons under the Navigation submenu.
- Press **Esc** to return to the previous screen.
- Saved measurements also contain setup information.
- Recalled measurements display in purple and may change the current instrument settings (*which will not be saved*) in order to display the recalled measurement.
- Calibration information is recalled with setup files but not recalled with measurement files.
- Use the Left arrow key to move out of a folder.
- Use the Right arrow key to move inside of a highlighted folder.

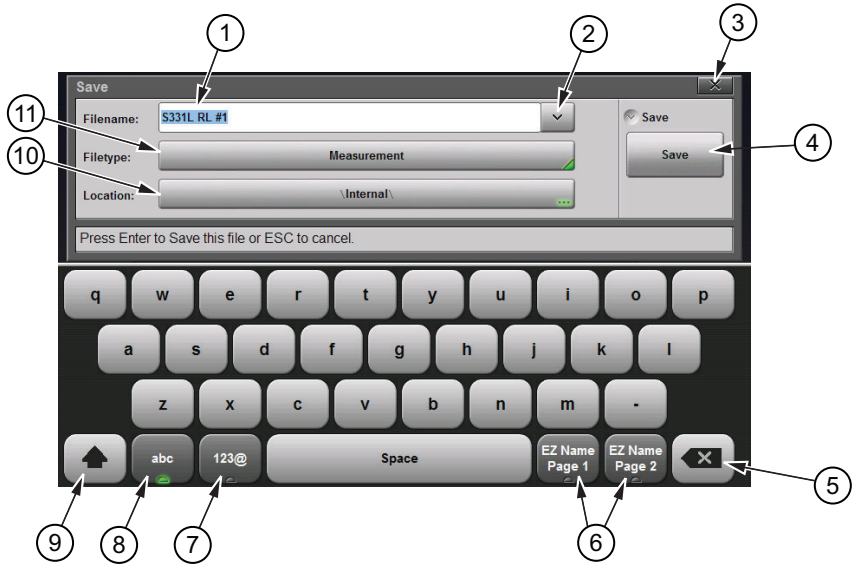
8-3 File Types

File name extensions used in the Site Master S331L include:

`*.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
`*.csv` for saving formatted data in text file with Comma Separated Values
`*.vipi` for Video Inspection Probe measurement files

8-4 Save File

Press the **Save** (7) keypad key to open the Save dialog box. Alternatively, you can press the Save icon in the "System Function Tool Bar", or press **File** (1) on the keypad, then press Save. In Video Inspection Probe mode, the Save icon automatically applies the current auto filename settings, if enabled, to the saved file (see Figure 12-4).



1	File name edit box
2	Recent file names (tap to view)
3	Close dialog box (without saving)
4	Press Save to save the file and close the dialog box. Press **Esc** or the Close button (item 3 above) to cancel.
5	Delete or Backspace key (applies to file name field)
6	EZ Name Keys
7	Digits and symbols keyboard
8	Alphabetic keyboard
9	Shift key
10	Current save location. Tap the button to change the save destination.

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

11	Current file type. Tap the button to change.

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

File Name

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

`S331L 1x [RL] #5.dat`, where:

`1x` = Single display
`2x` = Dual display

`RL` = Return Loss
`DTF-RL` = Distance to Fault Return Loss
`CL` = Cable Loss
`VSWR` = Voltage Standing Wave Ratio
`DTF-VSWR` = Distance to Fault Voltage Standing Wave Ratio
`SC` = Smith Chart
`PH` = 1-Port Phase
`PM` = Power Meter
`HiPM` = High Accuracy Power Meter

The file sequence number (#n) is automatically incremented each time a file of the same type is saved. The file extension is determined by the type of file being saved, such as measurement (.dat), setup (.stp), or screen shot (.png).

To enter a custom file name, simply type over the default name. Optionally, you can use the EZ Name keyboards to quickly enter character strings that make up a custom file name.

EZ Name Keyboards

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

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



Figure 8-2. EZ Name Keyboards

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

EZ Name Keys

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

1. Press Rename Keys on the appropriate EZ Name keyboard (Page 1 or Page 2). See.
2. Press the EZ Name key you want to define or rename.
3. Enter a new name, e.g., GREEN, for the selected key.

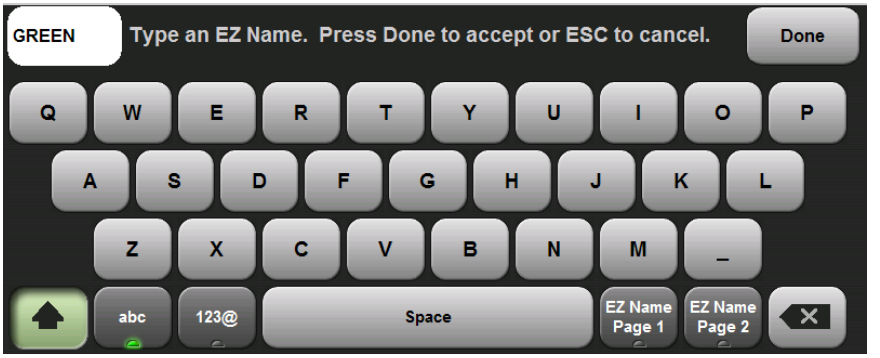


Figure 8-3. Renaming an EZ Name Key

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



Figure 8-4. Renamed EZ Name Key

Note	User-defined EZ Name keys are saved until a Master Reset is performed or you delete custom files with **Preset** (9) > Reset > Delete Custom Files > Keyboard EZ Names. Refer to the "Preset Menu" on page 9-23 for additional information.

File Type

The default file type in the Save dialog box is Measurement. To select a different type of data to save, press the Filetype button, then touch the appropriate key under the File Type menu. The selected file type determines the file name extension, as shown in Figure 8-5.

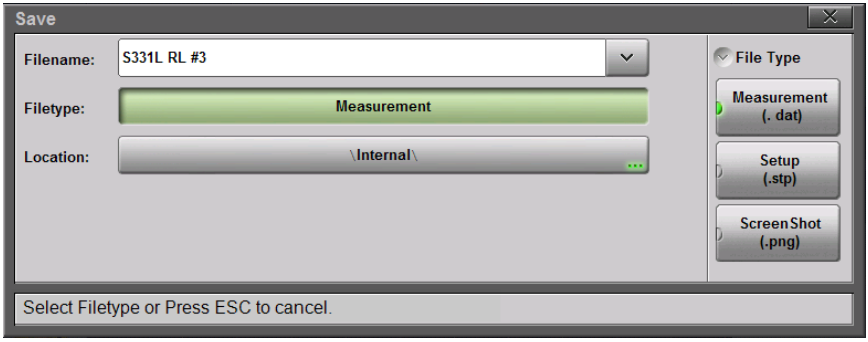


Figure 8-5. Save File Type

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

Note	In Video Inspection Probe mode, the Measurement file type (.vipi extension) saves the captured VIP image and analysis results. See Chapter 12, "Video Inspection Probe (VIP)".

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

Screen shot files contain a screen capture of the current display. The image appearance is set using the ScrnShot Settings.

Save Location

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

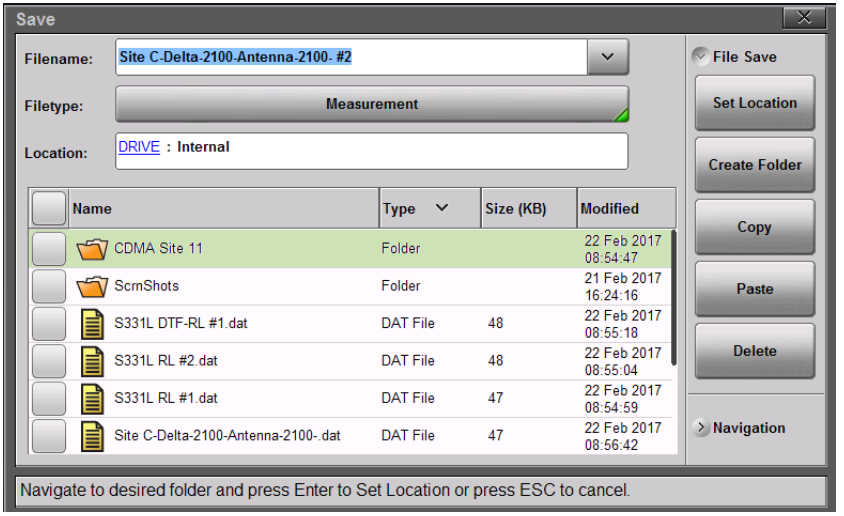


Figure 8-6. File Save Location

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

Once the destination folder is selected, press the Set Location button.

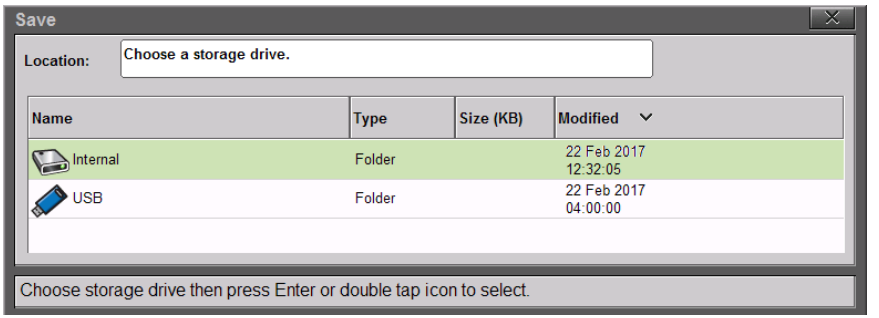


Figure 8-7. Choose a Storage Drive

8-5 Recall File

You can recall a previously saved measurement or setup or a screen shot file either from the instrument internal memory or from a removable USB drive. Only one file of any type can be recalled at a time.

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

Recall a Measurement

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

   In the example below, the selected file is a Cable Loss measurement file located on a removable USB drive.

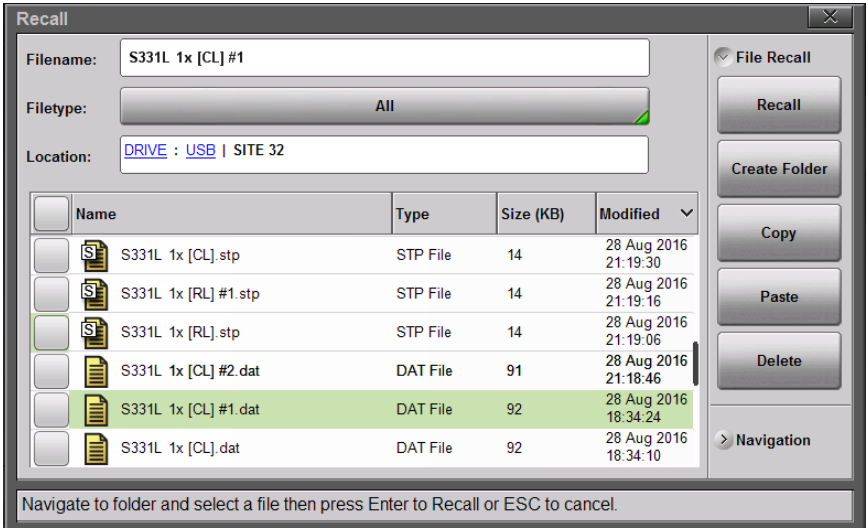


Figure 8-8. Recall Dialog Box

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

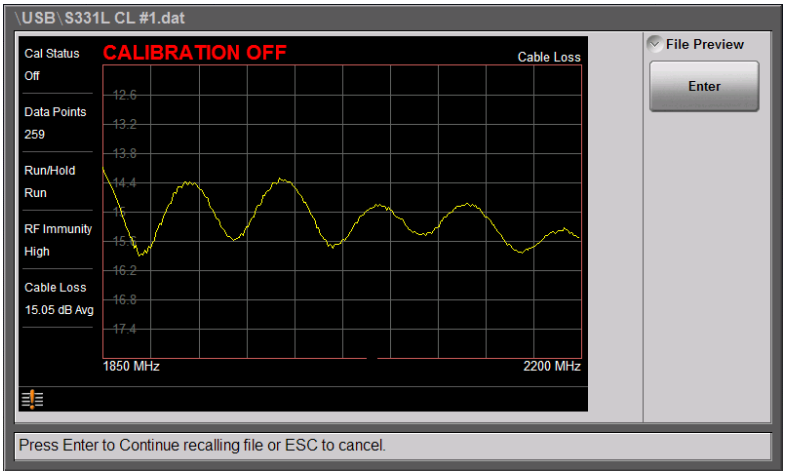


Figure 8-9. Preview of a Recalled Measurement

6. Figure 8-10 illustrates a recalled measurement and active trace.

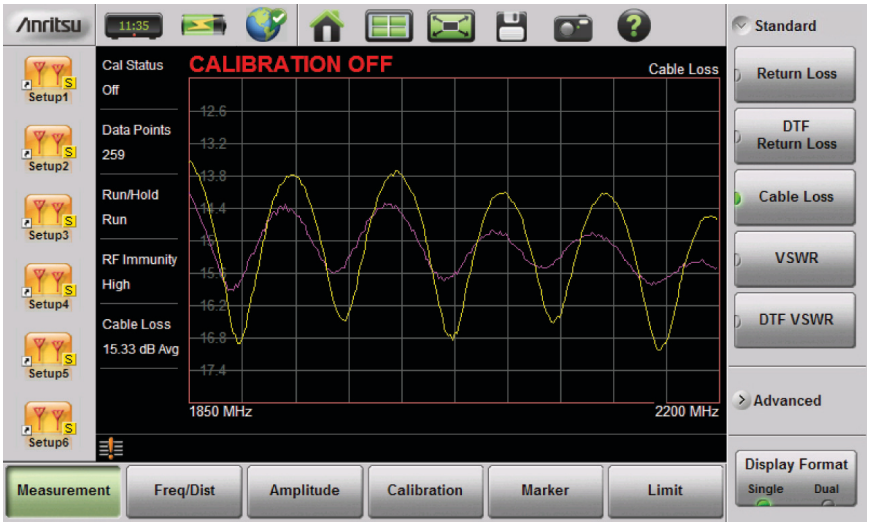


Figure 8-10. Recalled Measurement and Active Trace

The recalled measurement is the purple trace and is overlaid on the current active (yellow) trace. In Figure 8-10, the recalled measurement is used to compare the cable loss of two different RF cables. Recalled measurements are automatically saved to trace memory for use in trace match functions. To see the recalled measurement and the current measurement simultaneously, select Trace & Memory in the Trace Display submenu. Refer to "Trace" on page 3-44.

Recall a Setup

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

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

Recall/Preview a Screen Shot

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

In the example below, the selected file is located in the default ScrnShots folder in the instrument internal memory.

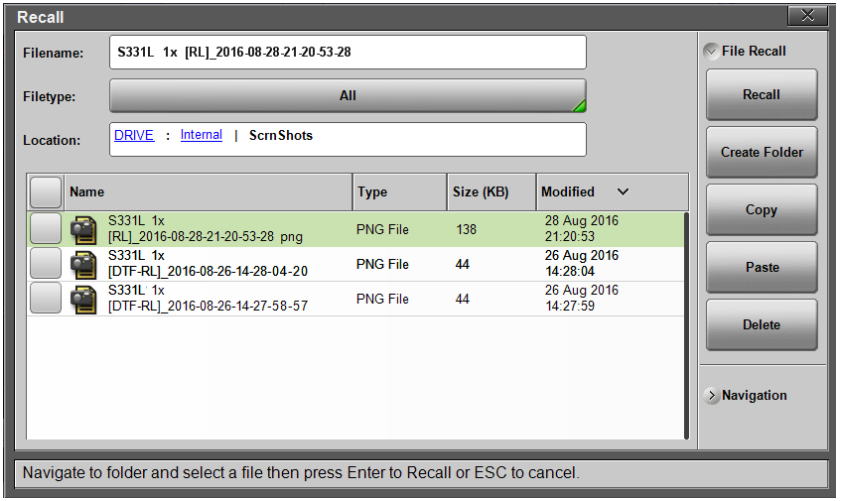


Figure 8-11. Screen Shot Selected for Recall

6. A preview screen displaying the selected screen shot is illustrated in Figure 8-12. Press **ESC** to return to the File Recall menu.

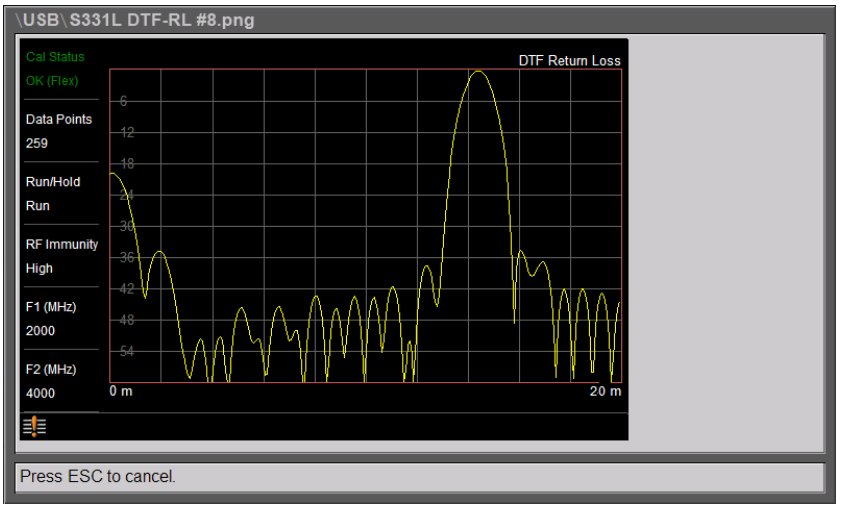


Figure 8-12. Preview of a Recalled Screen Shot

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.

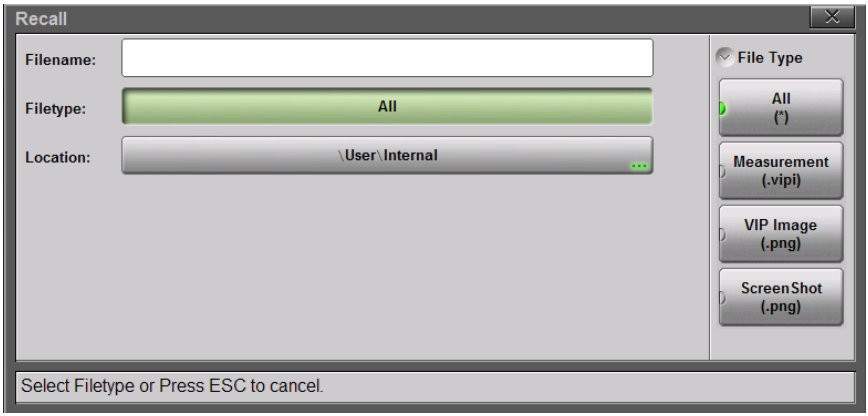


Figure 8-13. Recall File Type (VIP Mode)

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

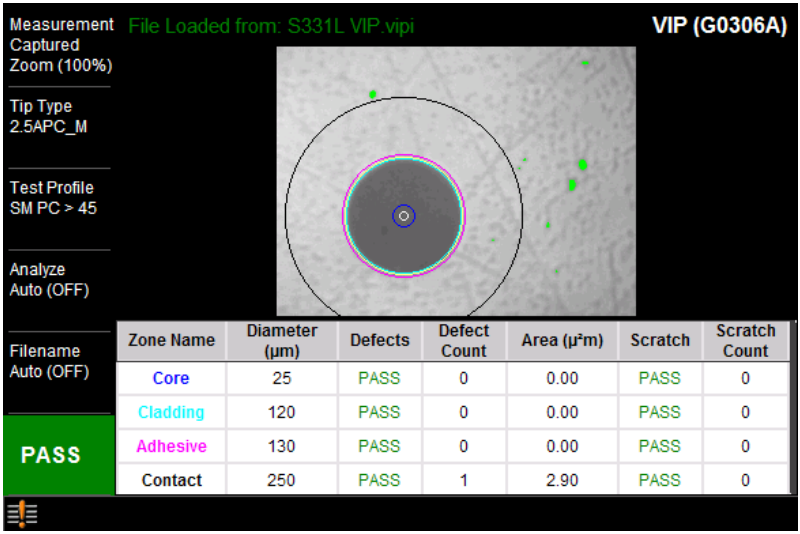


Figure 8-14. Recalled VIP Measurement File

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).

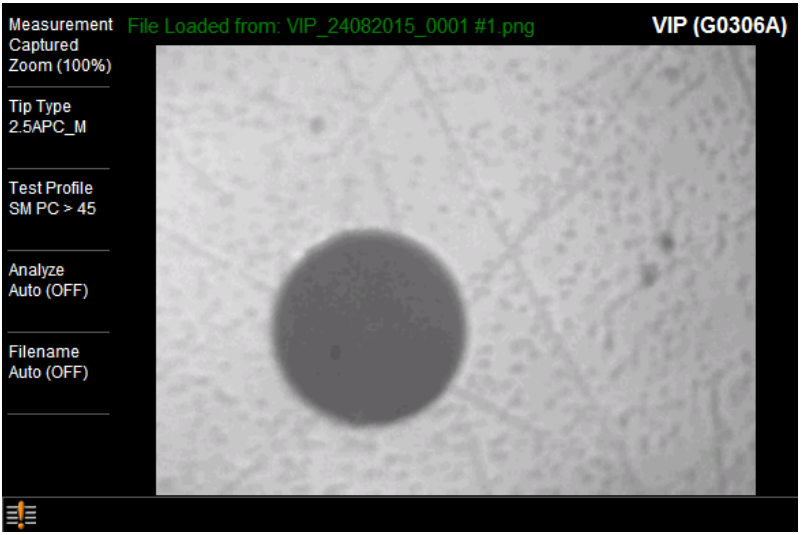


Figure 8-15. Recalled VIP Image File

A recalled VIP image can be analyzed and the results included in a VIP report. Refer to "Measurement Menu" on page 12-13.

8-6 Rename File

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

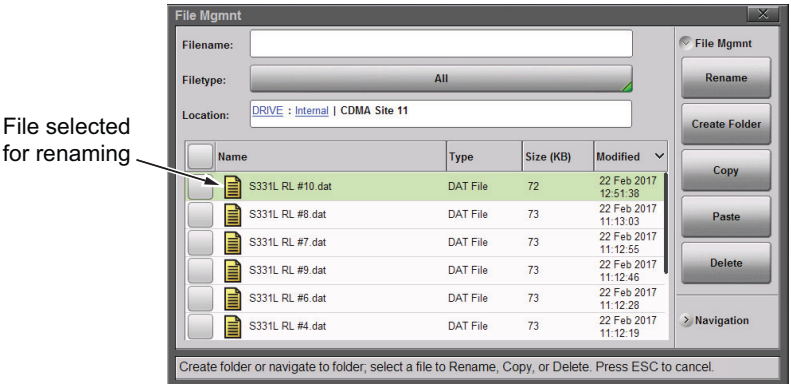


Figure 8-16. Select a File to Rename

4. Press the Rename submenu key to open the New Name edit box and on-screen keyboard.
5. Enter the new file name. Optionally, you can use the EZ Name keyboards to enter preset character strings. Refer to "EZ Name Keyboards" on page 8-4.

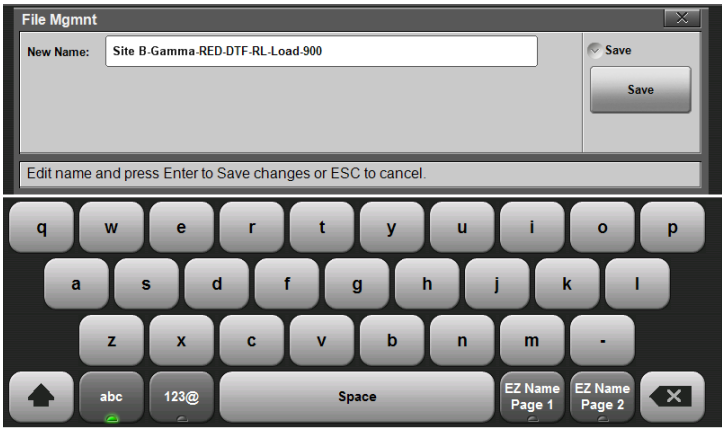


Figure 8-17. Enter a New File Name

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

Figure 8-18 illustrates the file directory with the renamed file.

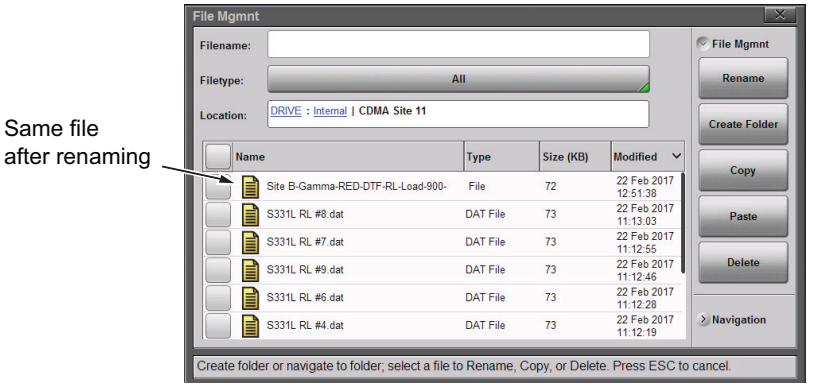


Figure 8-18. Renamed File

8-7 Copy and Paste File

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 a removable USB 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. Press the **File** (1) key to display the File menu.

2. Press File Mgmnt to open the File Mgmnt dialog box.

3. Navigate to the file you wish to copy or move and press the checkbox next to it to select. Use the Navigation submenu keys as needed to move through a long list of files.

You can select a single or multiple files and folders, as illustrated in Figure 8-19. Press the top checkbox to select all files and folders in the current directory.

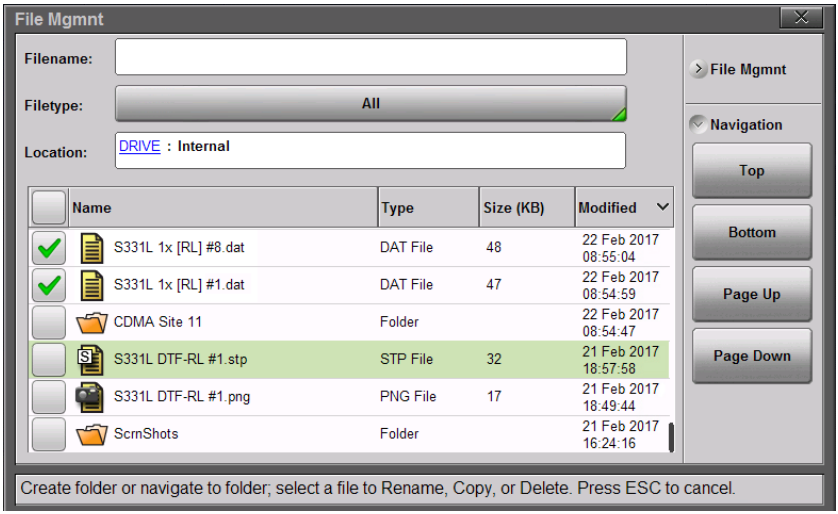


Figure 8-19. Multiple Item Selection

4. Under File Mgmnt, select Copy.
5. Insert a USB memory stick into one of the Site Master's USB ports.
6. Double-tap on Drive in the Location field, then double-tap on the USB drive icon.
7. Navigate to the destination folder as needed, then press Paste to either copy or move the selected files and folders from internal memory to the USB drive. See Figure 8-20.
8. In the Paste Selection message box, press Paste or Move, as appropriate. Paste will create copies of the selected files in the

destination folder. Move will place copies in the destination folder and remove the selected files from the source location.

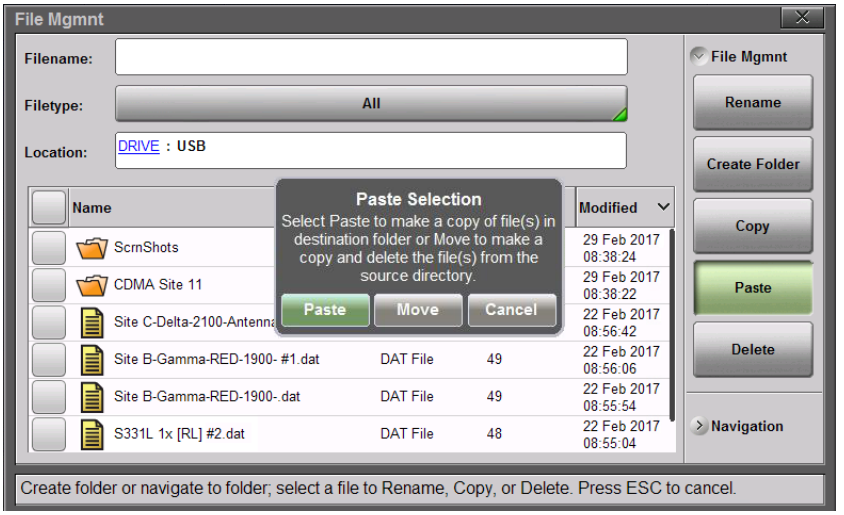


Figure 8-20. Paste File

9. If files with the same name already exist in the destination folder, a confirmation dialog will display, prompting you to select whether to overwrite some or all of the files.

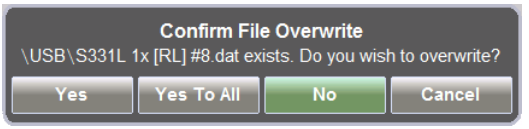


Figure 8-21. File Overwrite Confirmation

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

   You can select a single or multiple files and folders, as illustrated in Figure 8-22. Press the top checkbox to select all files and folders in the current directory.
4. Under File Mgmnt, press Delete. Touch Yes in the confirmation message box if appropriate.

   The Delete function deletes all selected files, including files not created by the S331L. Use caution when deleting files.

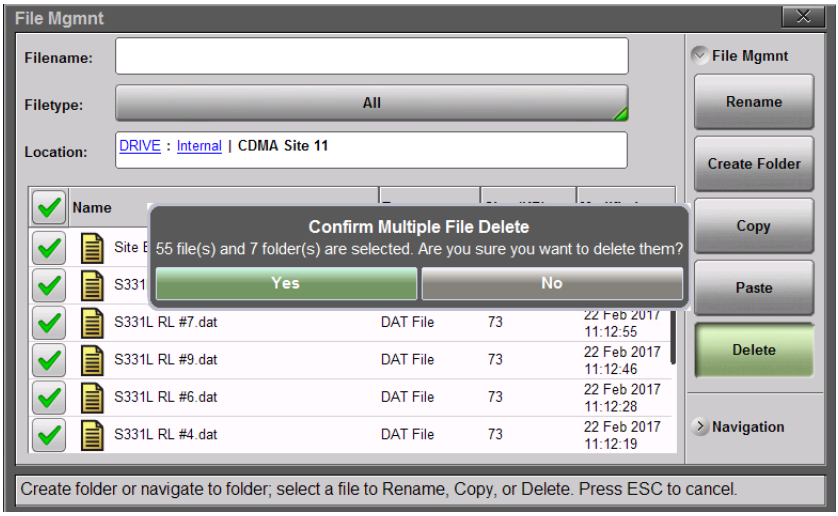


Figure 8-22. Delete Files

8-9 Create a Folder

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

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

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

4. Under File Mgmnt, press Create Folder to open the Foldername edit box and on-screen keyboard.
5. Enter the new folder name. Optionally, you can use the EZ Name keyboards to enter preset character strings. Refer to "EZ Name Keyboards" on page 8-4.



Figure 8-23. Enter a New Folder Name

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

Figure 8-24 illustrates the newly created folder in internal memory.

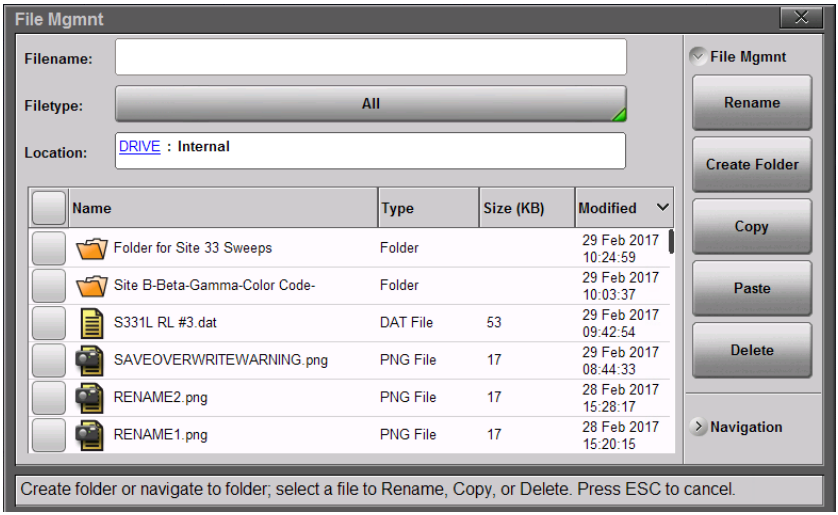


Figure 8-24. New Folder Created

8-10 File Menu Overview

Figure 8-25 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 12-7 on page 12-8).

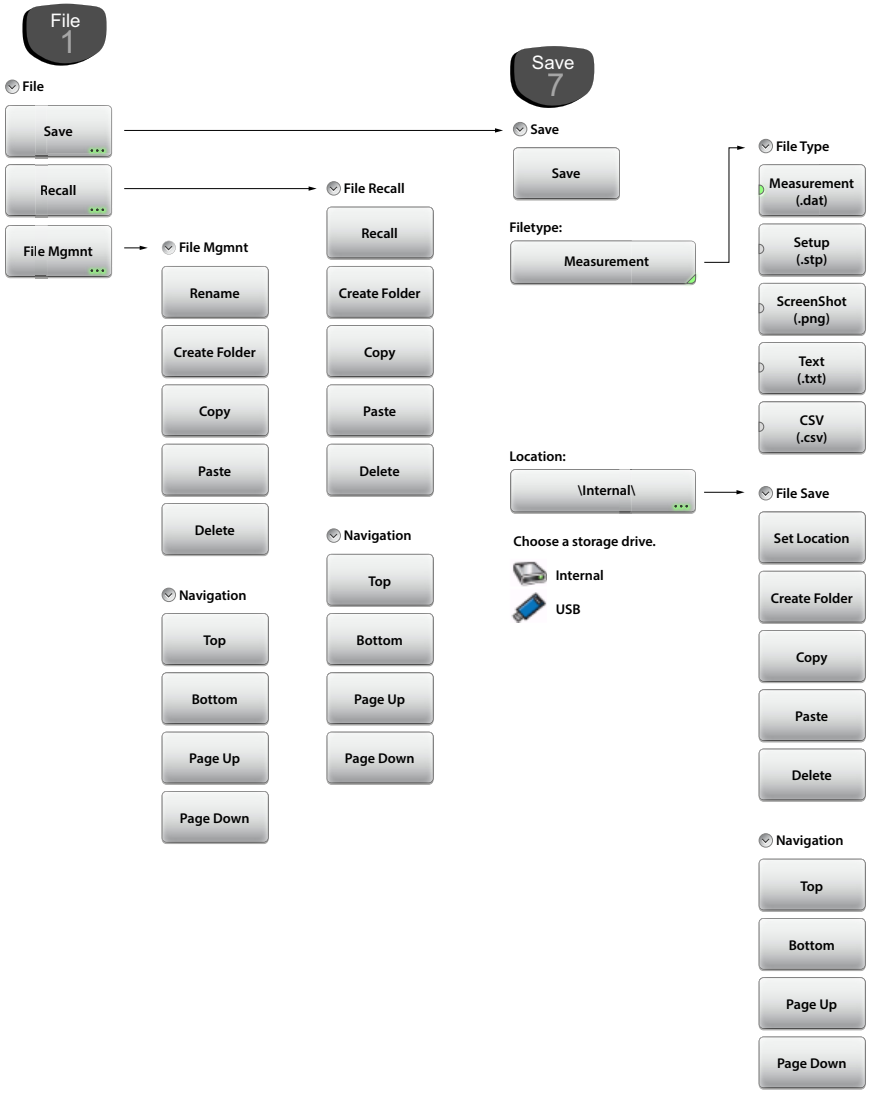
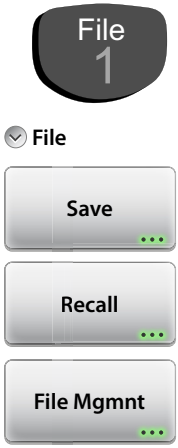


Figure 8-25. File Menu Map

8-11 File Menu

Key Sequence: **File** (1)



File:

Save: Press this submenu key to display the "Save Menu" on page 8-24 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 8-25.

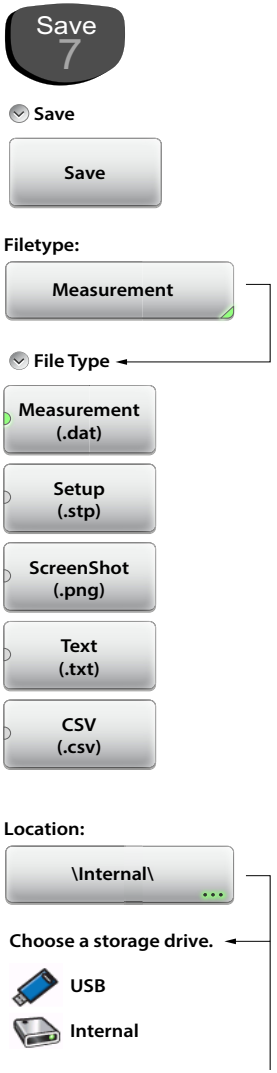
Recall: Press this submenu key to display the "Recall Menu" on page 8-26. This menu is for recalling a measurement or setup data from internal memory or from a USB flash drive. The Recall function can also be used to preview saved Screen Shot Files.

File Mgmnt: Press this submenu key to display the "File Mgmnt Menu" on page 8-28. 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 8-26. 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 type of data to save. Refer to "File Type" on page 8-7.

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 an image capture of the current display. Capture settings are set in the "Display/Audio Menu" on page 9-18.

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

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

The selectable file types are different in Video Inspection Probe (VIP) mode. See Figure 12-7 on page 12-8.

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. Refer to "Save Location" on page 8-8.

Figure 8-27. Save Menu (1 of 2)



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 8-24.

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 8-18), 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.

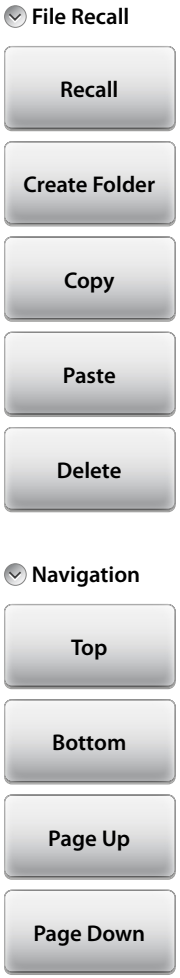
Bottom: Press this key to navigate to the bottom item of the current location.

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:

Recall: Press this submenu key to recall the selected file. Measurements, setups, or screen shots can be recalled.

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 File" on page 8-9 for additional information.

Recalled setups change the current setup including measurement type, frequency/distance, amplitude, marker, and limit data.

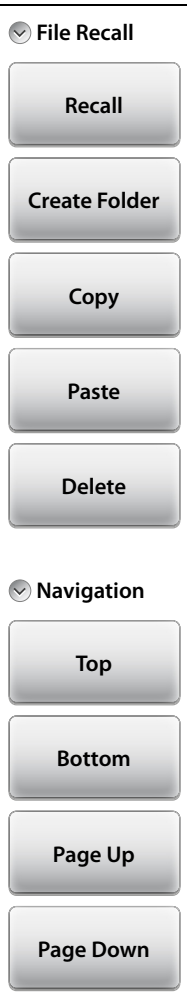
Recalled screen shots are previewed on the Site Master. Press **ESC** to return to the File Recall menu.

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 8-18), 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.

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



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.

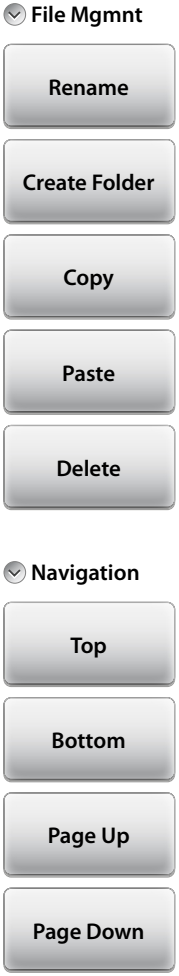
Page Up: Moves up one screen of items (7 rows) in the current location.

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

Figure 8-28. Recall Menu (2 of 2)

File Mgmnt Menu

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



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 8-18), 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 8-29. 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:

Section 9-2 “Self Test” on page 9-1

Section 9-3 “Touch Menu” on page 9-3

Section 9-4 “Help Menu” on page 9-5

Section 9-5 “Updating the Site Master Firmware” on page 9-9

Section 9-6 “Screen Shot Capture” on page 9-10

Section 9-7 “System Menu Overview” on page 9-12

Section 9-8 “System Menu” on page 9-13

Section 9-9 “Preset Menu” on page 9-23

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 (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.

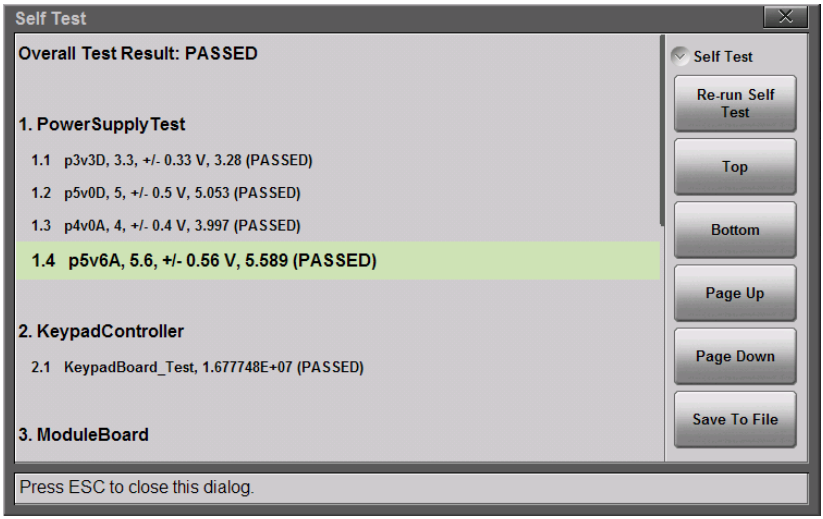


Figure 9-1. Site Master Self Test

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.

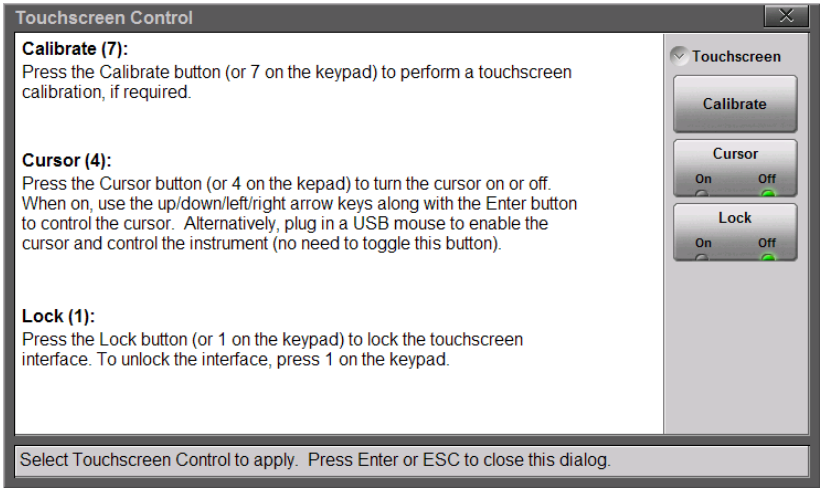
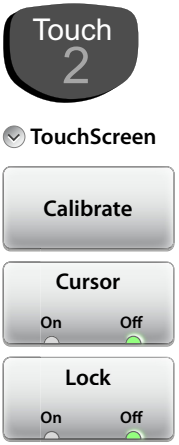


Figure 9-2. Touchscreen Control



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 2-2) 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).

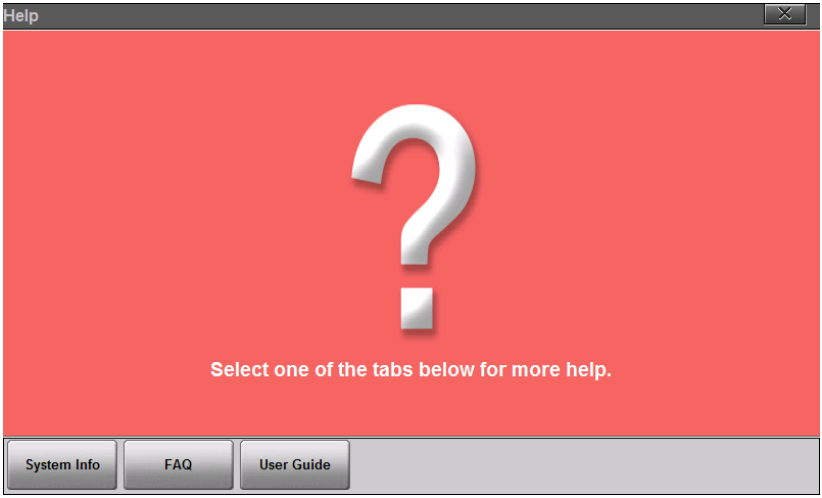


Figure 9-4. Main Help Menu Screen

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

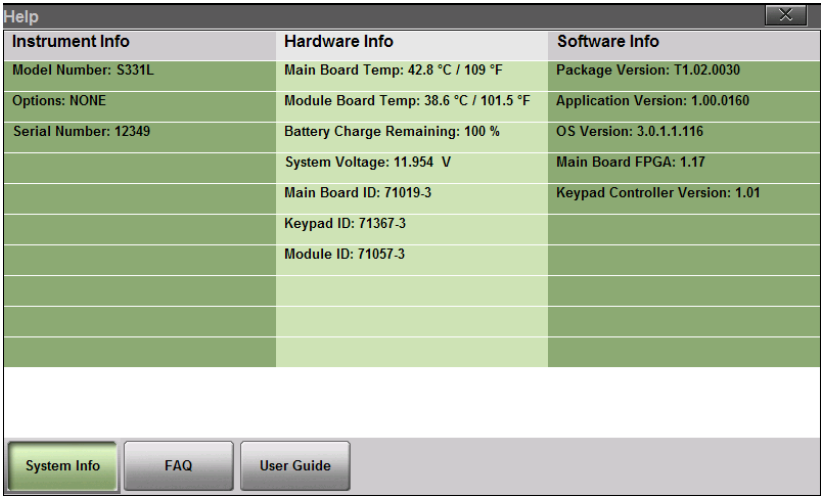


Figure 9-5. System Info

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  to close and return to the main help menu screen.
Press **Esc** or  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.

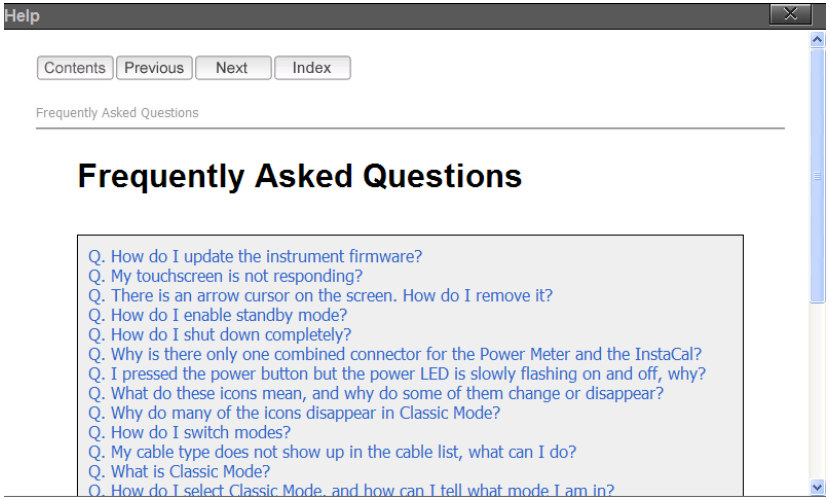


Figure 9-6. FAQ File

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

9-5 Updating the Site Master Firmware

To view the software package version currently installed on the instrument, press the Anritsu logo in the upper left corner of the display screen, then press the SW Info key in the Status dialog box.

Software updates are downloaded from the Anritsu product page:

http://www.anritsu.com/en-us/test-measurement/products/s331l

Go to the Downloads page and download the installer to your PC.

Note	The "Firmware Revision History" page has a link to download a summary of the firmware changes.

1. Run the installer executable file and follow the on-screen instructions.
2. After the firmware update is saved on a USB memory stick, remove the memory stick from the computer.
3. With the Site Master instrument turned off, insert the memory stick into a USB port.
4. Turn on the Site Master.
5. Press the **Preset** (9) key.
6. Under the Reset submenu, press Update Firmware. The Update Firmware dialog (Figure 9-8) appears.

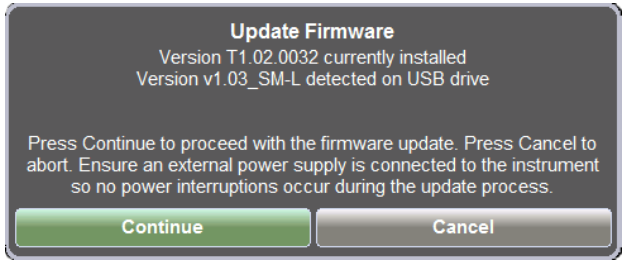


Figure 9-8. Update Firmware Message

7. Select CONTINUE to begin the firmware update or CANCEL to cancel.
8. After the update is complete, the instrument will power down. Restart the instrument to complete the update.

9. 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.

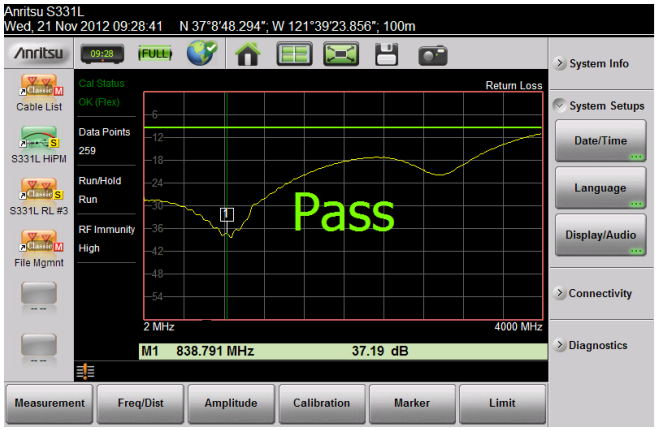
9-6 Screen Shot Capture

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,  .

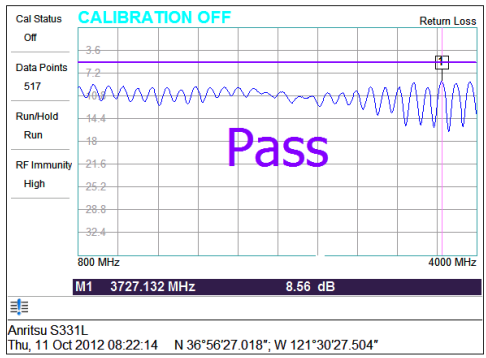
The file is automatically named based on the instrument model and measurement type. Screen shot files are saved to the instrument's internal memory in the ScrnShots folder (Drive : Internal | ScrnShots).

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 9-18 for details. Figure 9-9 on page 9-11 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.

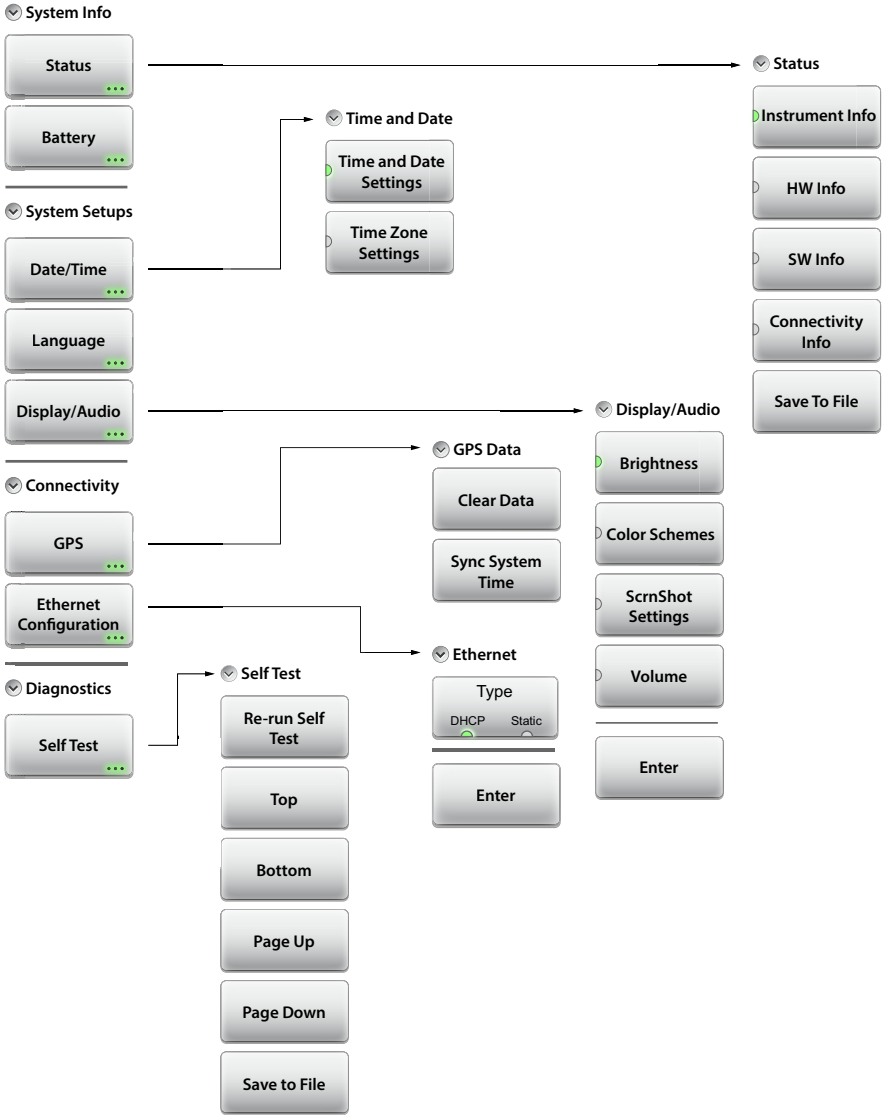


Figure 9-10. System Menu Keys

9-8 System Menu

Key Sequence: **System** (8)



System Info:

Status: Press this submenu key to display the "Status Menu" on page 9-15, 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 9-16.

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

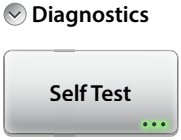
Display/Audio: Press this submenu key to access the "Display/Audio Menu" on page 9-18, which includes display, screen shot, and volume settings.

Connectivity:

GPS: Press to display the "GPS Menu" on page 9-20.

Ethernet Configuration: Press this submenu key to display the "Ethernet Configuration Menu" on page 9-22, 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:

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:

Instrument Info: Displays the instrument model, installed options, serial number, instrument name, hours of operation, and the number of power cycles.

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: Press this submenu key to display the version of various software components.

Connectivity Info: Press this submenu key to display the Ethernet IP Address and MAC address of the instrument.

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

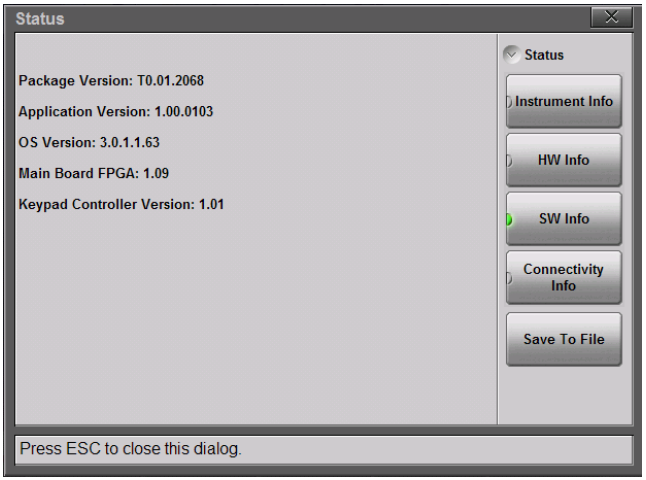


Figure 9-13. System Status Dialog Box

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 9-20.

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

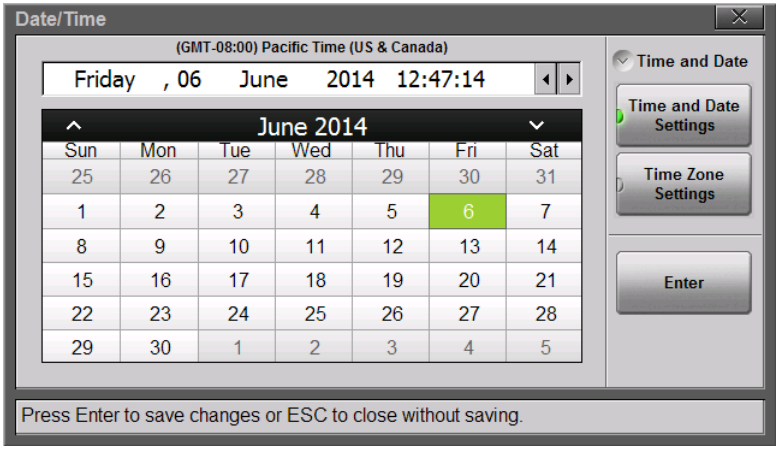


Figure 9-15. Date/Time Dialog Box

Display/Audio Menu

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

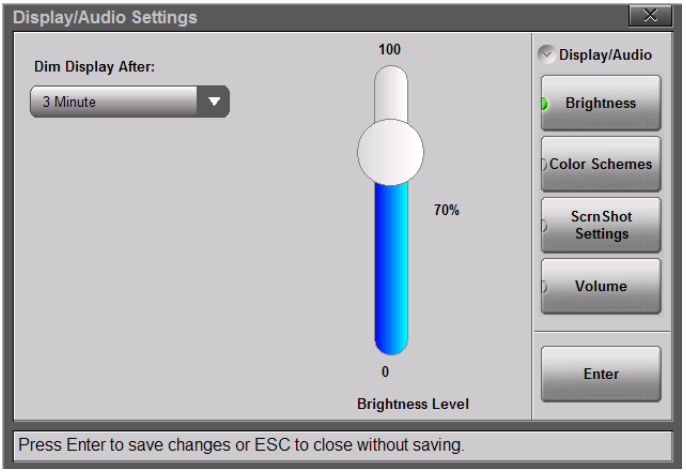


Figure 9-16. Display Brightness Dialog Box



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)



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 9-11.

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



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 9-16.

Figure 9-18. GPS Menu

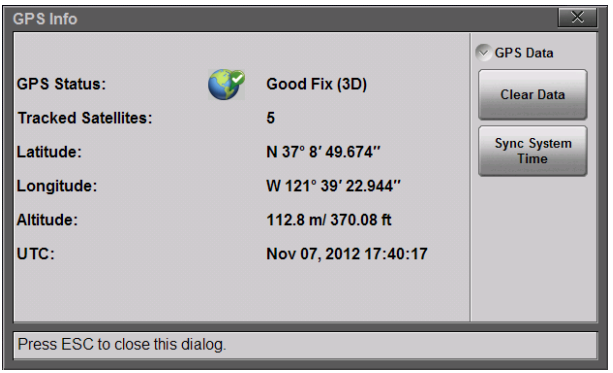


Figure 9-19. GPS Info

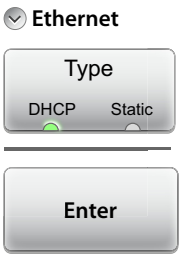
Note	An exclamation mark (!) is appended to the GPS location data in screen captures when the instrument is using Last Fix instead of current GPS information.



Figure 9-20. (!) Indicates Last Fix GPS Data

Ethernet Configuration Menu

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



Ethernet

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

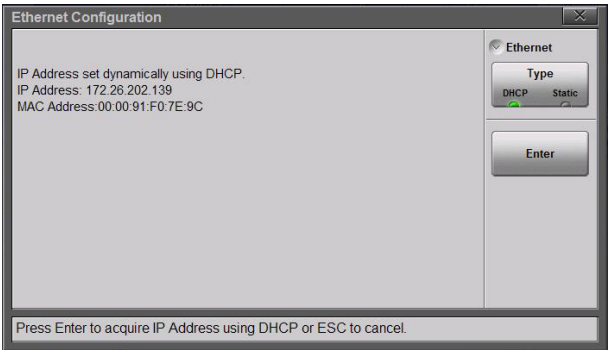


Figure 9-22. Ethernet Configuration Dialog - DHCP

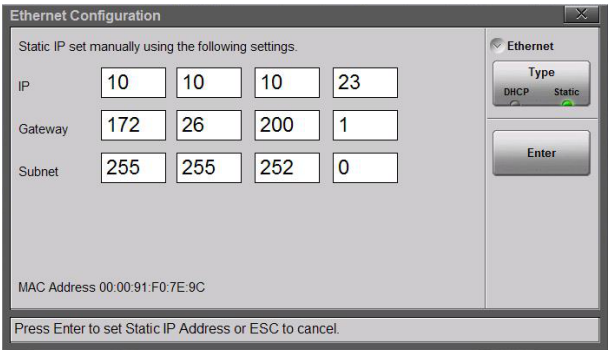
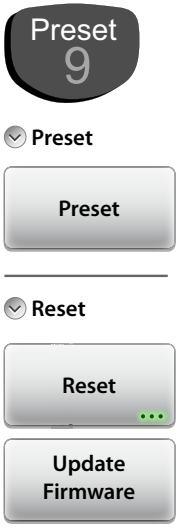


Figure 9-23. Ethernet Configuration Dialog - Static

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)



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

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 (see Figure 9-26 on page 9-25).

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 "Updating the Site Master Firmware" on page 9-9 for additional information.

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

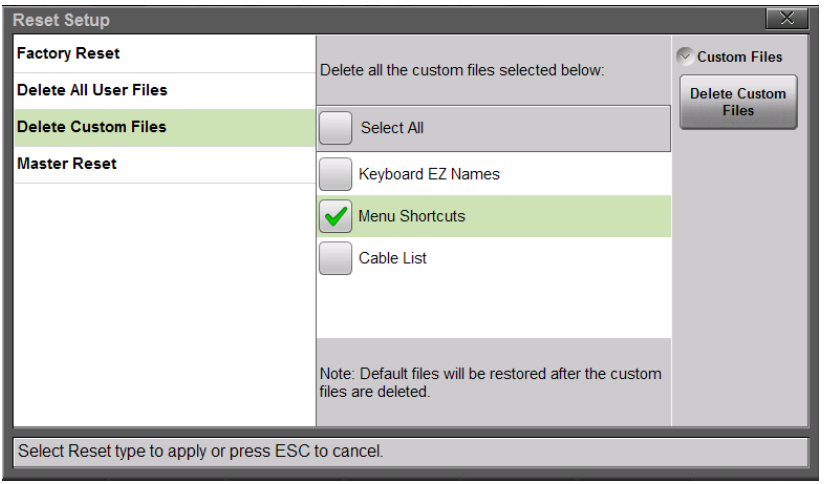


Figure 9-25. Delete Custom Files

If the Site Master is not functioning as expected, perform a preset. All the current settings and applied calibration factors will be cleared.

Note 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.

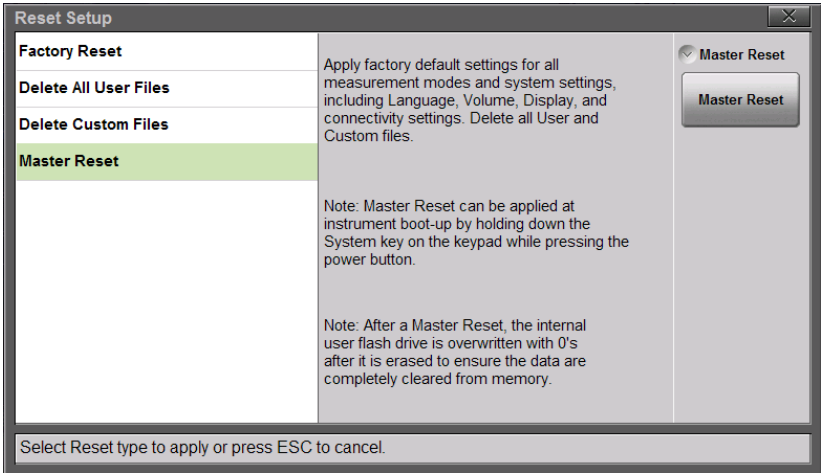


Figure 9-26. Master Reset

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  will display the current battery information (Figure 10-1). Press **ESC** to clear the message.

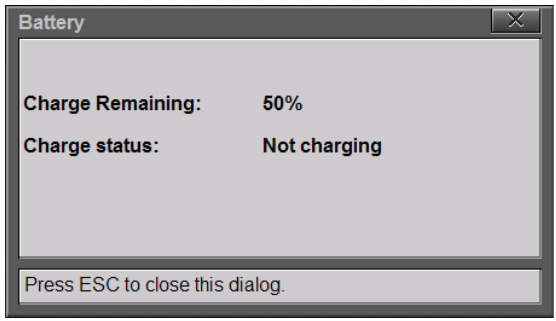


Figure 10-1. Battery Information

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).

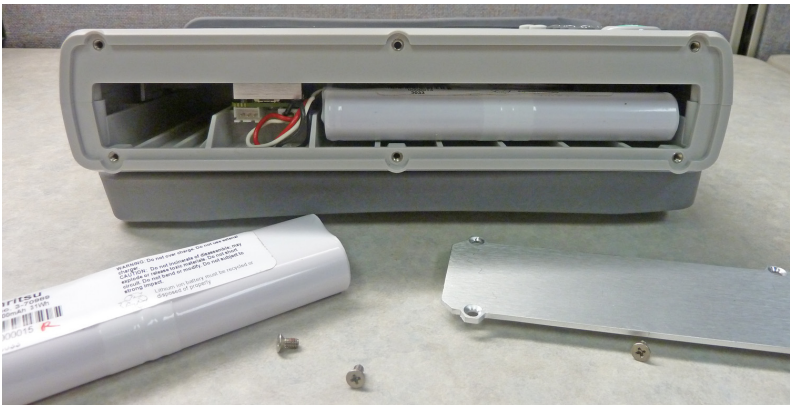


Figure 10-3. Replacing the Batteries

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

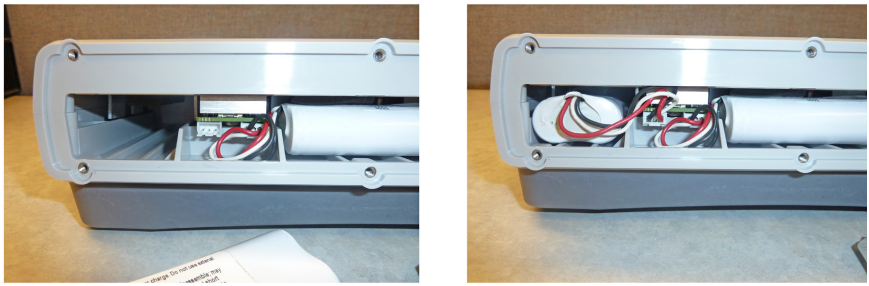


Figure 10-4. Adding the Second Battery

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

11-1 Introduction

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

Tool Box applications may be downloaded from the Anritsu website at anritsu.com/en-US/test-measurement/support/technical-support/handheld-tools-tool-box

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

11-2 Line Sweep Tools (LST)

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

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

11-3 easyTest Tools

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

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

To recall an easyTest file:

1. Press **Menu** on the S331L interface screen.
2. Press the easyTest  icon on the Menu Shortcut window.
3. In the easyTest Recall dialog, select the .ett file and press Recall.

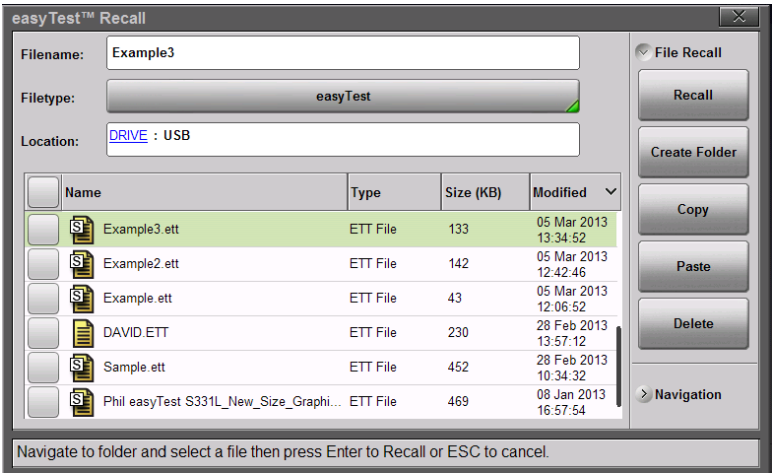


Figure 11-1. easyTest Recall Dialog Box

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

Chapter 12 — Video Inspection Probe (VIP)

12-1 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/B/C. See Figure 12-1. 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 12-1. Anritsu G0306A Video Inspection Probe

12-2 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 12-3.
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 12-4. 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 12-4.
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.

12-3 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/B/C 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 12-1. The standard tips are compatible with common types of bulkhead adapters. The universal tips are typically used for inspecting patch cords.

Table 12-1. 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 12-2.

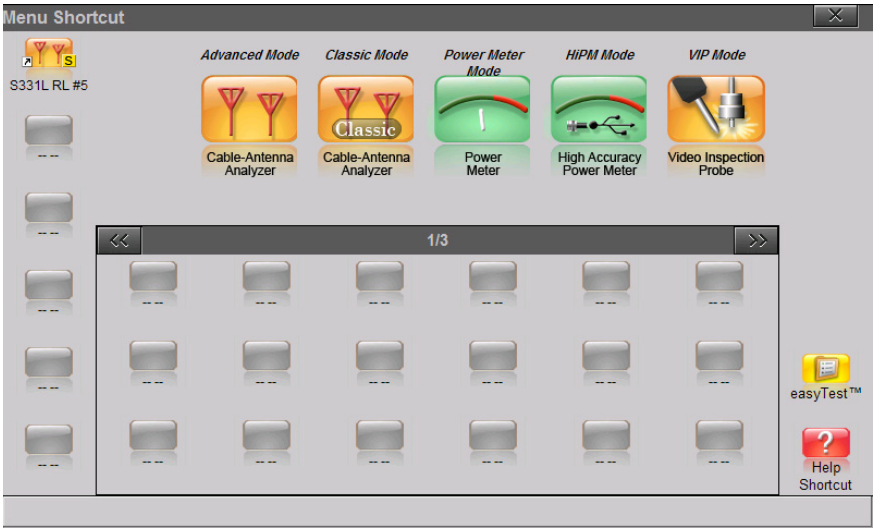


Figure 12-2. Menu Screen

VIP Test Settings

To access the VIP test settings, press the Setup main menu key. Refer to "Setup Menu" on page 12-12 for a description of the submenu keys.

1. The Probe Model submenu key shows the currently selected VIP model. The Site Master supports all Anritsu G0306A/B/C probe models.

Note	Select G0306B by pressing the Probe Model submenu from when G0306C model is connected.

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 12-1 on page 12-3 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.

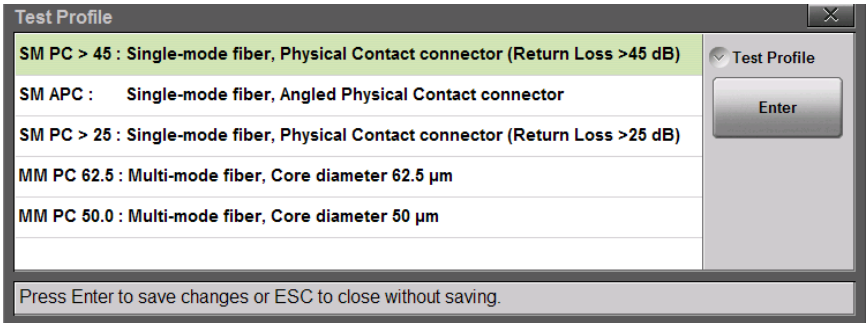


Figure 12-3. VIP Test Profile Selection Box

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 12-4. 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.

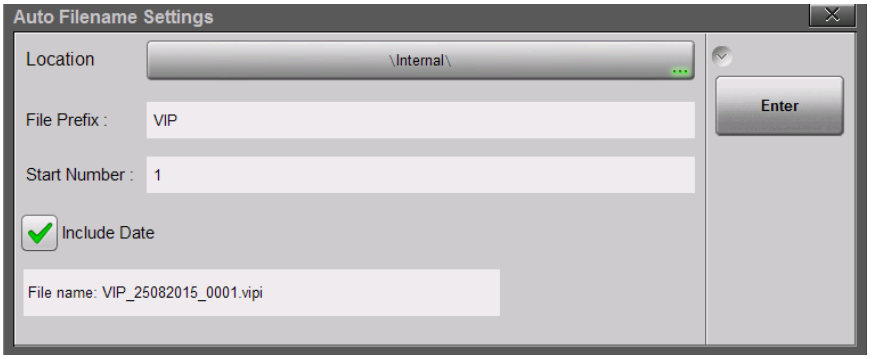


Figure 12-4. Auto Filename Settings Dialog

12-4 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 12-5.

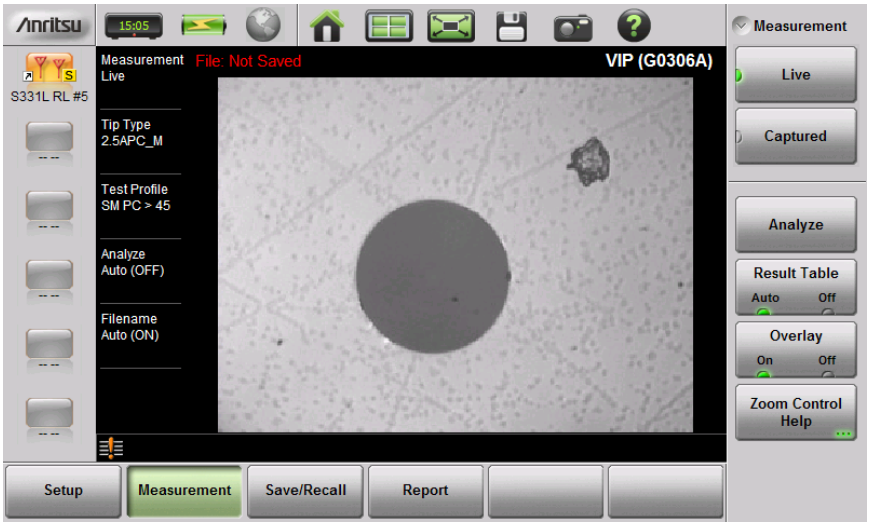


Figure 12-5. VIP Image Live View

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 8-14.

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 12-5.
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 12-12).

   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 12-6. 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.

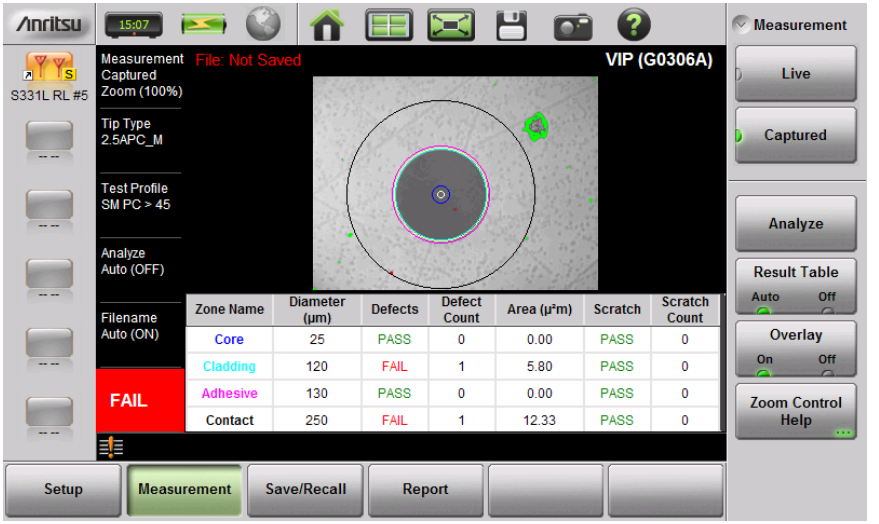


Figure 12-6. VIP Image Captured and Analyzed

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 12-4.

   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 8-3.

9. Enter the file name.

10. To select the type of file to save, press the Filetype button, then press the desired submenu key. See Figure 12-7.

    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

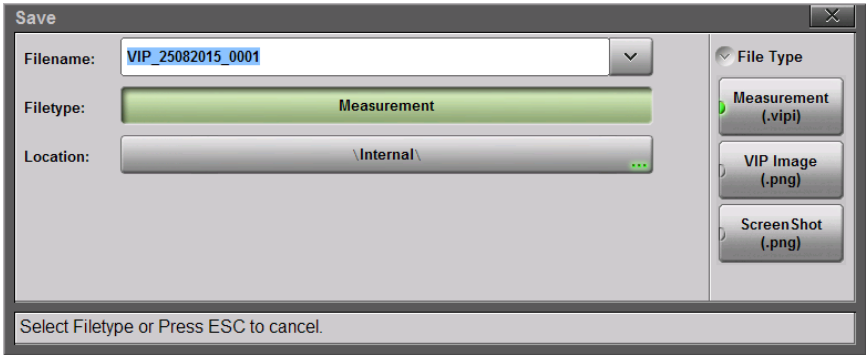


Figure 12-7. VIP File Type

11. Optionally, press the Location button and select the destination folder as described in "Save Location" on page 8-8.

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.

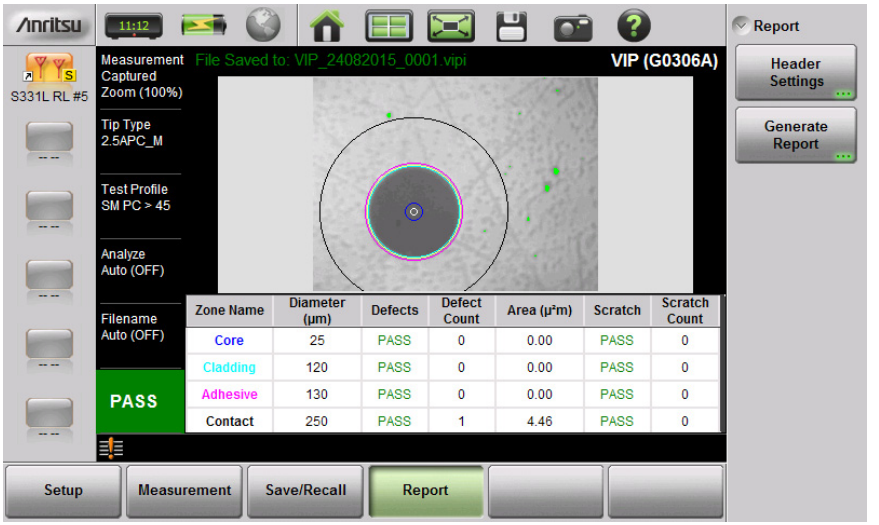


Figure 12-8. VIP Report Menu

1. Press Header Settings to enter or change the report header data.

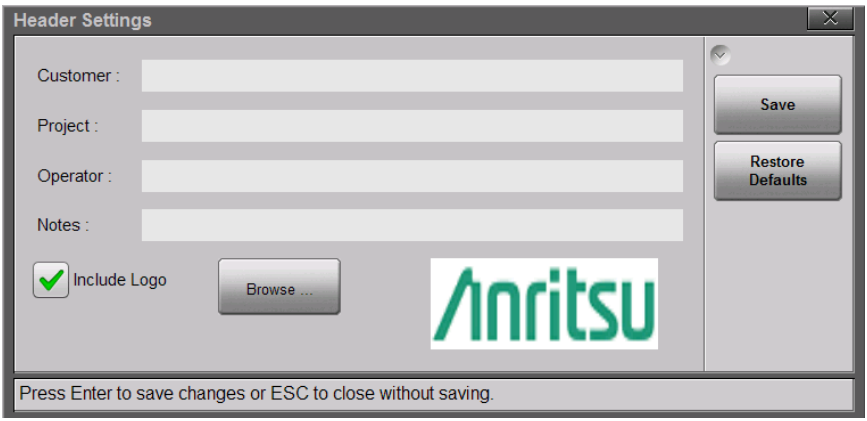


Figure 12-9. VIP Report Header Settings Dialog

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 12-10.

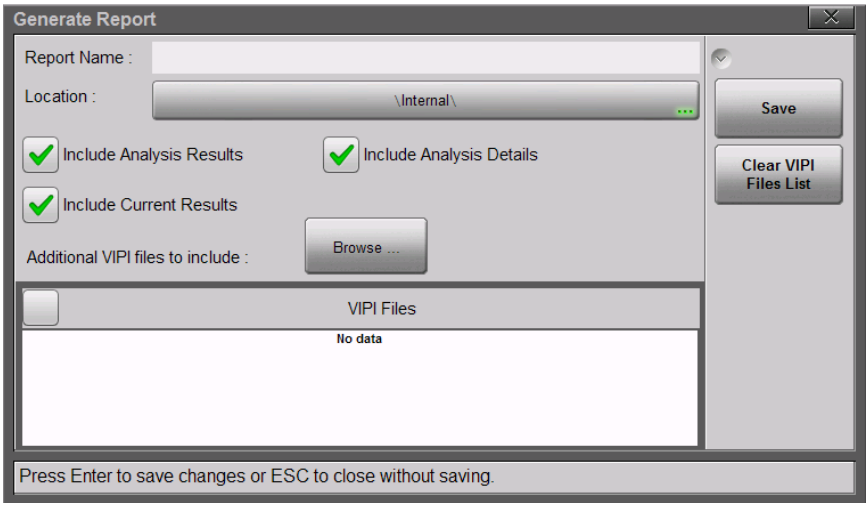


Figure 12-10. Generate Report Dialog

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.

12-5 VIP Menus

Figure 12-11 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).**

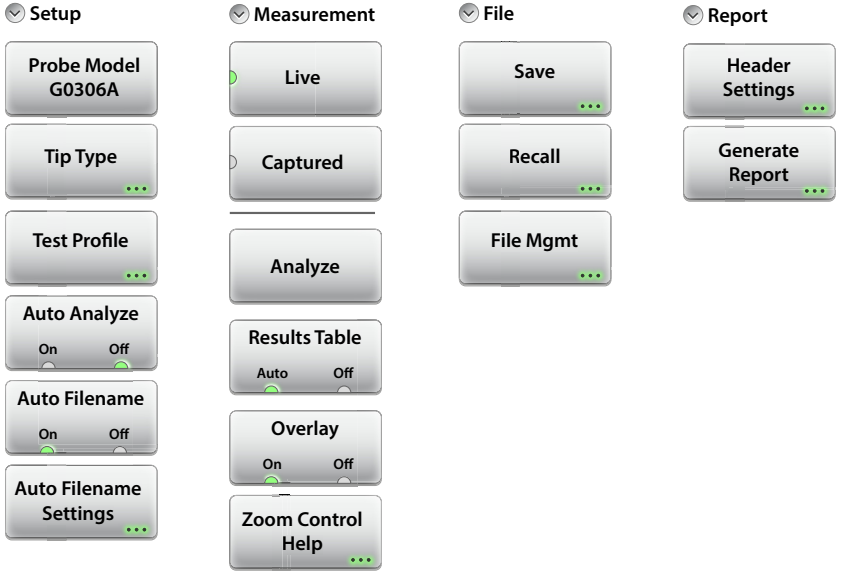


Figure 12-11. VIP Menu Map

Setup Menu



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 12-1 on page 12-3 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 12-3 on page 12-5.

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 12-4 on page 12-5. 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 DDMMYYY. For example:

VIP_0001.vipi
VIP_21082015_0001.vipi

Measurement Menu

Key Sequence: **Measurement**



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 12-12. VIP Measurement Menu

File Menu

Key Sequence: **Save/Recall**



Save: Press this key to open the Save dialog (Figure 8-1 on page 8-3). 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 12-7 on page 12-8.

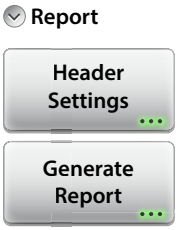
Recall: Press this submenu key to open a previously saved VIP measurement file (.vipi extension) or VIP image (.png extension). Refer to "Recall a VIP Measurement (VIP Mode Only)" on page 8-13. Note that a captured screen shot of the display cannot be recalled and analyzed.

File Mgmt: Press this submenu key to display the "File Mgmnt Menu" on page 8-28. 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 12-13. File Menu

Report Menu

Key Sequence: **Report**



Header Settings: Press this submenu key to enter or change report header information. Refer to "VIP Reporting" on page 12-9.

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 12-14. 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 9-23 and then cycle the instrument power. If the error messagepersists,callyourAnritsuServiceCenter.
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 related to this product and technology.

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)

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P

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Anritsu Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA
http://www.anritsu.com