



# E7000L SitePROFILER™

Handheld Cable & Antenna Analyzer

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User Guide  
Version 160823



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# Chapter 1 — General Information

## Introduction

This chapter provides a general description of the E7000L SitePROFILER™ Cable & Antenna System Analyzer. Topics covered in the section include the following:

- About the E7000L SitePROFILER
- Standard Accessories
- Available Product Measurement Options
- Optional Accessories
- Preventative Maintenance
- Annual Service Verification
- ESD Caution
- Battery Replacement

### 1-1 About the E7000L SitePROFILER

The E7000L SitePROFILER is a handheld Cable and Antenna System analyzer that performs RF coaxial and optical feedline measurements aimed at simplifying the installation, maintenance and troubleshooting of a wireless site's feedline and antenna system. Base RF measurements include:

- Return Loss
- Voltage Standing Wave Ratio (VSWR)
- Distance-to-Fault (DTF)
- Cable Loss
- 1-Port Phase
- Smith Chart

Optional feedline measurements can be added at the time of purchase or at the later date in the field as your test needs evolve. Measurement options include:

- RF Power Meter
- Optical Power Meter
- Visual Fault Locator (VFL)
- Fiber Inspection

An internal GPS receiver is also available as a software-enabled product option. The GPS receiver enables the SitePROFILER to save location coordinates as well as measurement traces.

A bright 7-inch color display provides visibility even in broad daylight, while the instrument's Li-Ion battery delivers more than 8 hours of battery life. The resistive touchscreen and keypad enable users to navigate menus by touch while entering text and numbers directly.

The internal 1GB flash memory can store approximately 5,000 traces or 2,000 setup files. Measurement data and setup files can also be saved to a USB storage device or transferred to PC via LAN cable.

The SiteWorkbench companion software included provides a simple and easy way to manage, archive, and analyze current and past measurements, as well as generate and print reports. It also allows you to customize your cable, antenna, and signal standards lists.

With its lightweight, handheld design, ease of use, and rich functionality for testing both RF coaxial and fiber-optic feedline and antenna systems, the E7000L SitePROFILERs provides the optimal test solution to characterize a cell site's infrastructure.

## 1-2 Standard Accessories

The following components are included with your E7000L SitePROFILER:

- Rechargeable Li-Ion Battery: 7.4V, 7.5Ah (PN: E8000-300)
- AC/DC Adapter, 11-14 VDC (PN: FP06-DBA)
- Vehicle Plug-in Lighter Adapter (PN: E8000-0400)
- "Y" OSL Calibration Device (PN: E7000-700)
- 1.5m Test Port Extension Cable (PN: E7000-702)
- CD-ROM Measurement Center Software & User's Manual (PN: E7000-0100)
- Soft Carrying Case (PN: E7000L-0110)

## 1-3 Available Product Measurement Options

Option Part Number	Description	Order No.
DML-015	Inline RF High Power Meter (requires external sensor, PN E7000A-00500)	2121.8000.50
DML-E7000L-0040	Internal RF Power Meter, 20MHz – 4.4GHz	2130.7000.28
DML-E7000-OPM	Optical Power Meter (includes VFL measurement option)	-
DML-DI-1000	Fiber Inspection measurement mode	6250.0900.11
DML-E7000L-0030	Internal GPS module	2130.7000.30
DML-7000L-0060	Internal 802.11a/b/g Wi-Fi module	2130.7000.31

The Deviser software-enabled measurement options can be added at the time of purchase, or at a later date as your test needs evolve – without having to return the product to Deviser Instruments or one of its authorized service centers.

These measurement options are detailed below.

### Inline RF High Power Meter (Option DML-015)

The inline RF high power meter option provides true RMS measurements with accurate measurements for both CW and complex digitally modulated signals. It supports a 50M~6GHz frequency range. Option DML-015 does not include the external sensor apparatus (PN: E7000A-00500) necessary for the RF Power Meter.

### Internal RF Power Meter, 20MHz – 4.4GHz (Option DML-E7000L-0040)

The Internal Power Meter option provides standard-accuracy RF power testing without the need for external equipment.

**Optical Power Meter (Option DML-E7000-OPM)**

The Optical Power Meter mode ensures accuracy and linearity over a wide wavelength range. It can be used for all optical power measurements, such as optical fiber loss measurement and optical device performance evaluation. No separate power meter accessory or additional tools are needed. Included with option DML-OPM is the Visual Fault Indicator (VFL) mode, providing a powerful light source for locating damaged or misapplied fiber.

**Fiber Inspection measurement mode (Option DML-DI-1000)**

Inspection of fiber optic connections is essential to ensure the performance and longevity of fiber-optic connectivity. Option DML-017L makes it fast and easy to certify that every connection at a cell site is optimized for enduring performance. The E7000L supports the handheld fiber probe (PN: DI-1000LP) which is used to capture video images from the sensor, analyze the images for fiber-end face defects and contamination, and provide reliable PASS/FAIL results to guarantee the performance of your optical connections. The handheld fiber probe is not included with this option.

**Internal GPS Module (Option DML-E7000L-0030)**

The GPS High Precision option can be used to confirm the exact location (longitude, latitude, altitude) of measurement, as well as Universal Time (UT) information. Each trace can be stamped with location information to ensure you are taking measurements at the right location. Option DML-990L does not include the Deviser GPS-based antenna (PN: BDA700e).

## 1-4 Product Accessories

Part Number	Calibration Devices (Description)	Order No.
E7000L-1000	eCAL OSL Calibration Device, 2MHz – 4.4GHz	E7000L-1000
E7000-700	“Y” OSL Calibration Device, N(m), 42 dB, DC to 6.0 GHz, 50 Ω	E7000-700

Part Number	Precision Adapters (Description)	Order No.
DPAK-6G100	Precision Adapter Kit, 50Ω (PNMDM, PNFDM, PNMDf, PNFDF, PDFDF, PDFDM90°)	6130.0500.02
DPA-18NMNM	Precision Adapter, N(m) to N(m), DC to 18GHz, 50Ω	6190.0501.34
DPA-18NFNM	Precision Adapter, N(f) to N(m), DC to 18GHz, 50Ω	6190.0501.35
DPA-18NFNF	Precision Adapter, N(f) to N(f), DC to 18GHz, 50Ω	6190.0500.12
DPA-6NFDM	Precision Adapter, N(f) to 7/16 DIN(m), DC to 6GHz, 50Ω	6190.0500.17
DPA-6NFDF	Precision Adapter, N(f) to 7/16 DIN N(f), DC to 6GHz, 50Ω	6190.0500.24
DPA-6NMSF	Precision Adapter, N(m) to SMA(F), DC to 6GHz, 50Ω	6190.0500.42

Part Number	Test Cables – Armored & Phase Stable (Description)	Order No.
DTC-6PNMNF-1.5	RF Test Port Cable, Armored, Phase Stable, 1.5m, N(m) to N(f), 6GHz, 50Ω	DTC-6PNMNF-1.5
DTC-6PNMDF-1.5	RF Test Port Cable, Armored, Phase Stable, 1.5m, N(m) to 7/16 DIN(f), 6GHz, 50Ω	DTC-6PNMDF-1.5
DTC-6PNMDM-1.5	RF Test Port Cable, Armored, Phase Stable, 1.5m, N(m) to 7/16 DIN(m), 6GHz, 50Ω	DTC-6PNMDM-1.5
DTC-6PNMNF-3.0	RF Test Port Cable, Armored, Phase Stable, 3.0m, N(m) to N(f), 6GHz, 50Ω	DTC-6PNMNF-3.0
DTC-6PNMDF-3.0	RF Test Port Cable, Armored, Phase Stable, 3.0m, N(m) to 7/16 DIN(f), 6GHz, 50Ω	DTC-6PNMDF-3.0
DTC-6PNMDM-3.0	RF Test Port Cable, Armored, Phase Stable, 3.0m, N(m) to 7/16 DIN(m), 6GHz, 50Ω	DTC-6PNMDM-3.0

Part Number	Attenuators (Description)	Order No.
DATT-6NFNM-50-30	50W, 30dB, DC-8.5 GHz, Attenuator, N(f) to N(m), 50Ω	DATT-6NFNM-50-30
DATT-6NFNM-100-40	100W, 40dB, DC-6.0 GHz, Attenuator, N(f) to N(m), 50Ω	DATT-6NFNM-100-40

Part Number	Measurement Option Accessories (Description)	Order No.
E7000A-0040	Magnetic Mount GPS Antenna, USB (for use with measurement option DML-120)	E7000A-0040
DI-1000LP	Fiber probe (for use with measurement option DML-017L)	DI-1000LP



## 1-5 Preventative Maintenance

The E7000L SitePROFILER preventive maintenance consists of inspecting and cleaning the unit, all RF connectors, and all accessories. To clean the unit's surface, use a soft, lint-free cloth dampened with water.

If necessary, the unit case can be cleaned with water and a very mild non-solvent based cleaning solution to remove dirt and light stains.

**NOTE: To avoid damaging the display or instrument case, do not use solvents or abrasive cleaners.**

Clean the RF connectors and center pins with a cotton swab dampened with denatured alcohol. The fingers of the N (f) connectors and the pins of the N (m) connectors should be unbroken and uniform in appearance. If you are unsure whether the connectors are damaged, gauge the connectors to confirm that the dimensions are correct. The test port cable should be uniform in appearance, and not stretched, kinked, dented, or broken.

## 1-6 Annual Service Verification

Accurate test measurements are critical to your business. Deviser Instruments recommends an annual calibration and performance verification as a means to keep your instrument and OSL or eCAL calibration components in optimal working condition. Please contact Deviser Instruments for an RMA number and the location of the nearest Authorized Deviser Instruments service center. Our authorized service centers are skilled and certified in the calibration, service, repair, and performance verification of our products. Failure to adhere to this policy will result in the immediate termination of your instrument warranty and/or service contract.

## 1-7 ESD Caution

The E7000L SitePROFILER, like other high performance instruments, is susceptible to electrostatic discharge (ESD) damage. Coaxial cables and antennas often build up a static charge, which may damage the E7000L input circuitry. E7000L operators must be aware of the potential for ESD damage and take all necessary precautions.

It is recommended to discharge the static by connecting a short or load device to the cable or antenna before connecting them to E7000L. It is important to remember that the operator may also carry a static charge that can cause damage. Following the practices outlined in the above standards will ensure a safe environment for both personnel and equipment.

## 1-8 Battery Replacement

The E7000L battery can be replaced without any tool use. The battery compartment is located on the left rear side (when the display is placed facedown). Remove the two screws, slide the cover down, and remove the battery. Installation is the opposite operation of removal.

**NOTE: When inserting the battery, the battery label should face the back of the instrument and the guide slot on the battery should be below the contacts. If the battery door is not latched, the battery may be inserted incorrectly.**



**NOTE: Use only Deviser Instruments-approved batteries, adapters, and chargers provided with this instrument.**

**CAUTION: When using the vehicle charger, make sure that the supply is rated for a minimum of 60 watts at 12 VDC, and that the socket is clean without any dirt or debris. If the adapter plug becomes hot to the touch during charging, please discontinue use immediately.**

**NOTE: Deviser recommends removing the battery for long-term storage of the instrument.**

## Chapter 2 — Instrument Overview

### Introduction

This chapter describes how to get started with the E7000L SitePROFILER Cable Analyzer. Topics covered in this section include the following:

- Unpacking the E7000L SitePROFILER
- Powering on the E7000L
- Exploring the E7000L
  - Display Overview
  - Front Panel Overview
  - Test Panel Connector Overview
  - Symbols and Indicators
  - Changing date and time
  - Changing distance units
- About the Soft Carrying Case

### 2-1 Unpacking the E7000L SitePROFILER

Unpack and inspect the shipping package thoroughly to ensure that nothing was damaged during the shipment. Also check that your delivered package includes all of your ordered items in the shipment.

If contents in the package are damaged or defective, or if there are missing items, keep the shipping list and materials for the carrier's inspection and contact your nearest Deviser Instruments-authorized sales and service office.

The E7000L should include the following items in the shipping package. For a comprehensive list of compatible accessories, see Section 1-4.

### 2-2 Items included with E7000L shipment

Part Description	Part No.	Amt.	Order No.
E7000L SitePROFILER Cable & Antenna System Analyzer	E7000L	1	E7000L
Rechargeable Li-Ion battery pack	6130.0100.01	1	6130.0100.01
AC/DC power adapter, 11-14 VDC	FSP065-RAB	1	
Automotive cigarette lighter adapter	E8000-0400	1	
"Y" OSL Calibration Device, N(m)	E7000-700	1	
1.5m Test Port Extension Cable, 1.5m, N(m) to N(m), 6.0 GHz, 50Ω	E7000-702	1	6190.0501.03
LAN Ethernet Cable	DS8831-706	1	6190.0500.19
CD-ROM User's Manual and Measurement Center Software	E7000-0200	1	6190.0600.40
Soft Carrying Case	DS2800-008	1	

## 2-3 Powering On the E7000L

The E7000L is capable of approximately 8 hours' continuous use from a fully charged battery. The E7000L can also be operated from a 12 VDC source, which will simultaneously charge the battery. This can be achieved with either the AC-DC Adapter or Automotive Cigarette Lighter Adapter.

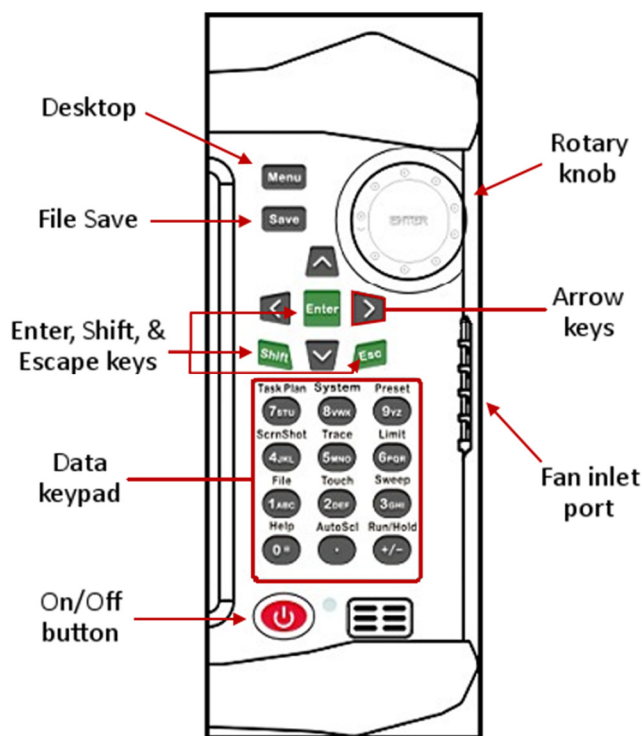
**CAUTION: When using the vehicle charger, make sure that the supply is rated for a minimum of 60 watts at 12 VDC, and that the socket is clean without any dirt or debris. If the adapter plug becomes hot to the touch during charging, please discontinue use immediately.**

To turn on the E7000L SitePROFILER, press and hold the On/Off button on the front panel (see diagram in Section 2-4) for approximately 2-3 seconds. The instrument will take approximately 60 seconds to complete power warm-up and load the application software. When this process is complete, the instrument is ready for use. To power the device off, press the On/Off button briefly.

In the event that the battery charge has been depleted, you will need to charge (or operate) the unit from its AC/ DC adapter until the battery charge is restored to 100%.

## 2-4 Exploring the E7000L SitePROFILER

The E7000L SitePROFILER features a menu-driven, touchscreen user interface that is easy to use and requires little training. Most measurement functions will employ the touchscreen UI, while other inputs will employ the front panel keypad located to the right of the display. The keypad buttons and inputs are detailed below.

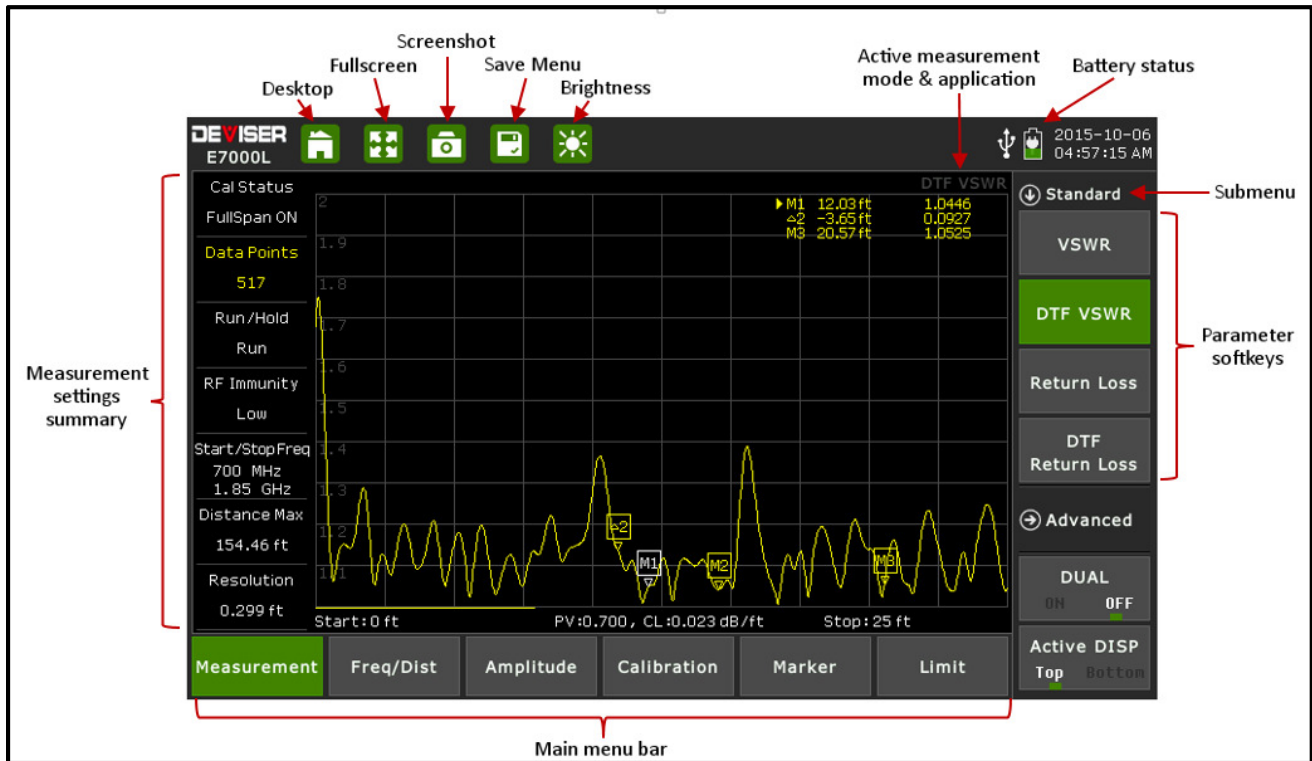


## 2-5 Display Overview

The E7000L employs a touchscreen display that is configured for ease of use and navigation. You can easily and quickly change measurement functions by touching either the **measurement tabs** located in the main menu bar (located horizontally along the bottom of the display), or the submenu functions (located along the right edge of the display). Keys displayed on the touchscreen are also referred to as **softkeys**.

Measurement settings are summarized along the left edge of the display. These settings can also be edited directly by touching the desired setting summary, which opens up its respective submenu or toggles a specific condition On/Off. The top row, the instrument's **toolbar**, features several shortcut icons that quickly and easily perform measurement tasks or simplify the operation of the instrument – for example, by expanding to full screen for better trace analysis.

*The graphic below highlights various icons and display definitions of the E7000L SitePROFILER.*



*E7000L SitePROFILER Cable Analyzer measurement display*

## 2-6 Touchscreen Keys Main Menu

There are six main menu keys arranged horizontally along the bottom of the touchscreen display. In Cable & Antenna measurement mode, these keys are: **Measurement**, **Freq/Dist**, **Amplitude**, **Calibration**, **Marker**, and **Limit**. The main menu function changes according to the instrument's active measurement mode: e.g., Cable Analyzer features different tools from Internal Power Meter.

The various measurement modes can be found by pressing the Menu key on the instrument's front panel (or by touching the desktop icon located at the top of the touchscreen display). Selecting a main menu key at the bottom of the touchscreen display will open a function-specific sub-menu.

## 2-7 Submenus

There are up to seven submenu keys arranged vertically along the right-hand side of the touchscreen display. The submenu keys will change according to the main menu function selected, e.g. the Freq/Dist main menu contains different submenu options from the Marker main menu. The active submenu will be displayed at the top of the vertical submenu block.

## 2-8 Front Panel Overview

Most measurement functions will employ the touchscreen UI, while other inputs will employ the front panel keypad located to the right of the display.

The keypad includes **Menu**, **Save**, **Enter**, **Shift**, **Escape** (ESC), and **Up/Down/Left/Right** keys, as well as a numeric data keypad. Depending on the current mode of operation, the number keys may also serve as dual-purpose measurement function keys.

Each of the dual-purpose keys is labeled with both a number and an alternate function, which is printed above the key. Simply press the numerical key to access its secondary function. When prompted for a numerical entry, the keypad will switch to entry mode.

For example, when you want to see the Limit submenu, simply press **Limit** (#6 on the keypad). But when you wish to edit the Start Frequency of your measurement (in the Freq/Dist menu), tap the Start Freq softkey and you will be prompted for a number; pressing the 6 key now will enter the number 6.

## 2-9 Front Panel Keys

The five main function menu keys are located to the right of the measurement display.

### Menu

Pressing the **Menu** key opens up the desktop function and displays the Cable Analyzer measurement mode. If other measurement modes have been installed on your E7000L, they will also be displayed on desktop. To activate a specific measurement mode, simply touch the desired measurement mode icon on the desktop: e.g., Cable Analyzer, Inline High Power Meter, etc.

### Save

Pressing the **Save** key opens up the file save menu, enabling you to quickly label and save a measurement. File types can be saved as a measurement setup, measurement or image. File names can be quickly entered by using the pop-up touchpad. Shortcut, quick-label descriptions are also available by touching page 1 or page 2 on the pop-up keypad.

### Enter

Pressing the **Enter** key enters the final data input, or selects a highlighted item from a list.

### Shift

Pressing the **Shift** key and then a number key executes the function that is located above the number key.

### Esc

Pressing the **Esc** key will cancel (escape) any setting that is currently being made, or any dialog box that is open.

### Rotary Knob

Turning the rotary knob changes the numerical values, scrolls through selectable items from a list, and moves the markers left or right. Pressing the "ENTER" button at the center of the rotary knob enters data, similar to the **Enter** button on the keypad.

## 2-10 Data Keypad Function Keys

When in parameter-editing mode, the data keys are active and will enter the number printed on them.

Otherwise, pressing a number key executes the function that is located above the number key. Measurement function keys are active when the instrument is *not* in parameter-editing mode.

### System

Pressing **System** (#8) opens the System submenu. In this menu, you can set various system parameters, display system info, and set system update. The system menu also allows you to change the date and time setting to your preferred format.

### Preset

Pressing **Preset** (#9) returns the E7000L SitePROFILER to factory settings and switches to Cable & Antenna measurement mode.

### ScrnShot

Pressing **ScrnShot** (#4) captures an image of the current display, saving it to internal memory as a bitmap (.bmp) file. Files are automatically named based on the measurement type.

### Trace

Pressing **Trace** (#5) opens the Trace submenu, enabling you to view the live trace and compare to a stored trace in the memory. You can also employ the data math function to compare the two traces.

### Limit

Pressing **Limit** (#6) opens the Limit submenu, enabling you to set measurement limit lines (including Pass/Fail message limit lines). An audio limit alarm can also be set to indicate that a measurement has exceeded a preset limit condition.

### File

Pressing **File** (#1) opens the File submenu, enabling you to quickly label and save a measurement. File types can be saved as a measurement setup, measurement or image. File names can be quickly entered by using the pop-up touchpad. Shortcut, quick-label descriptions are also available by touching X Name Page 1 or X Name Page 2 on the pop-up keypad.

### Touch

Pressing **Touch** (#2) opens the touchscreen calibration function.



**Sweep**

Pressing **Sweep** (#3) opens the Sweep submenu, enabling you to set sweep type, points, RF immunity, RBW, data averaging and data smoothing.

**Help**

Pressing **Help** (#0) opens the Help submenu, providing context-sensitive help for main menu functions. The Help screen displays instructions according to the measurement mode that is currently active.

**AutoScI**

Pressing **AutoScI** (.) automatically adjusts the vertical measurement scale according to the measurement selected, e.g. return loss, VSWR, or cable loss.

**Run/Hold**

Pressing **Run/Hold** (+/-) toggles the active sweep from Continuous (Run) to Single Sweep (Hold), and vice-versa. When in single sweep (Hold) mode, the sweep will start from the start frequency (or distance on the left of the display), sweep one time, and then stop at the stop frequency (or distance on the right hand side of the display) and HOLD this position until activated again. When in Hold mode, the hold symbol appears on the display.



The four **arrow keys** (around the **Enter** key) are used to scroll up, down, left, and 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, while the **Up/Down** arrow keys can also be used to move limit lines.

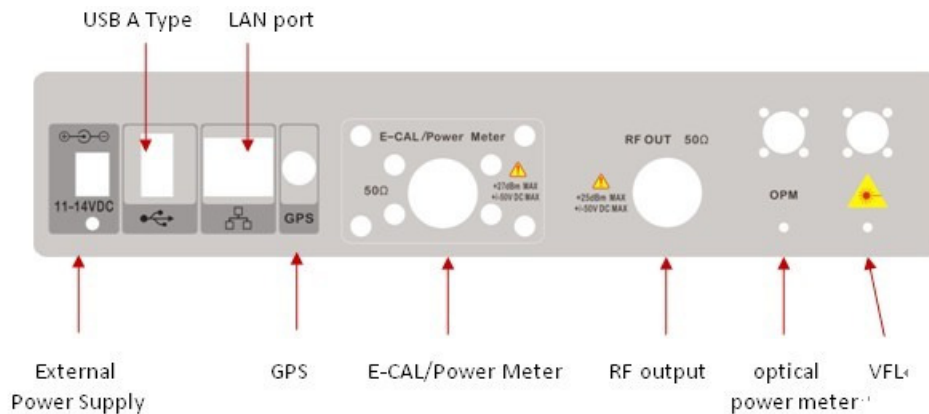
**LED Indicators**

The Power LED is located to the right of the On/Off key. This LED is green when the unit is on.

The Charging LED is located on the test panel. This LED is red when the battery is charging, and green when the battery is fully charged.

## 2-11 Test Panel Connector Overview

The connectors and indicators located on the test panel are described below.



### External Power

The external power connector is used to power the unit and for battery charging. Input is 12.5 VDC to 19 VDC at up to 3.42 A. The LED on the test panel indicates that the instrument is being charged up. This LED is colored red when the battery is charging, and green when the battery is fully charged.

### USB Interface - Type A

The E7000L has a Type-A USB port that accepts USB storage devices for transferring measurements, setup files, screen images, GPS modes, and other data.

### LAN port

The LAN port is used to connect the device to a PC with the SiteWorkbench software installed. This software provides a simple and easy way to manage, archive, analyze, and print measurement reports, and customize your cable list, antenna list, and signal standards list.

### GPS port

With the GPS option, all measurements can be tagged and exported to geo-enabled maps for an accurate record of site locations and measurements.

### ECAL / Power Meter port

The ECAL/Power Meter port features a N(m) connector that serves to provide optional ECAL OSL calibration and/or power meter measurements with the instrument's built-in power meter and sensor.

### RF In

50 Ω, N-Type female connector. This connector is used for ECAL and RF power measurements. Maximum input is +30 dBm at ±50 VDC.

### RF Out

50 Ω, N-Type female connector. This connector is used for Cable Analyzer reflection measurements. Maximum input +25 dBm at ±50 VDC.

### Optical Power Meter (OPM)

The OPM port features an FC connector, used with the optional Optical Power Meter (PN: DML-OPM) mode.

### VFL (Visual Fault Locator) Symbol

The VFL port features an FC connector that provides an optional light source, aiding optical fiber continuity checks and detection of spliced and/or bent fibers.

## 2-12 Symbols and Indicators

The following symbols and indicators on the display indicate the instrument's current status.

### Calibration Symbols

The current calibration status and type is displayed when in Cable & Antenna Analyzer mode.

- Calibration status **OFF**
  - The 7000L has not been calibrated.
- Calibration status **Full Span ON**
  - The E7000L has been calibrated with either Open, Short, and Load components or the electronic ECAL calibration device. When measurement frequency or sweep data points change, the calibration will remain valid.
- Calibration status **Standard ON**
  - The E7000L has been calibrated with discrete Open, Short, and Load components or the electronic ECAL calibration device. When measurement frequency exceeds calibration frequency range, the calibration data become invalid and the instrument must be re-calibrated.

### Battery Symbols



Green: Battery is 30% to 100% charged.



Yellow: Battery is 10% to 30% charged.



Red: Battery is 0% to 10% charged.



Green plug: Battery is currently charging.



Plug: Device running on external power. No battery installed.



USB connection: USB device is busy for data exchange.

When either the AC-DC Adapter or the 12 VDC adapter is connected, the battery automatically receives charge, and the battery symbol with the lightning bolt is displayed.

**CAUTION: Use only Deviser-approved batteries, adapters, and chargers with this instrument.**

When the instrument is connected to external power without a battery installed, the battery symbol is replaced by a plug body.

When the instrument is connected to a computer and is transferring or receiving data, the battery symbol is replaced by a USB icon.

## 2-13 Data Entry

### Parameter Setting

You can set parameters with the numeric keys, the arrow keys, or the rotary knob. It is simple to change the parameters quickly with the arrow keys. You can edit a parameter continuously with the rotary knob.

### Edit in position displayed

On a measurement display, many parameters are listed in place. You can move the highlight cursor at the place where a parameter appears, and press the Enter key to set it. The numeric keys, arrow keys, and rotary knob can be used to modify the parameter. Press Enter again to exit.

### Submenu Entry

Upon pressing the corresponding submenu key, the parameter will appear on the upper left corner of the display. You can set the parameter using the numeric keys, arrow keys, or the rotary knob, and press Enter to exit the editor.

### Text Entry

When saving a measurement, setup, or image file, you must create a filename. Use the numeric keypad to enter letters and numbers.

### Changing Date and Time

To change the date and time to your desired format, press the **System** (#8) key on the numeric keypad. This opens the System submenu, allowing you to change the date and time. Touch "Date & Time" to the left of the display; then use the touch keyboard, including the delete/back-arrow key, to set the correct date and time.

## 2-14 Making a Measurement

The E7000L SitePROFILER devices perform various cable & antenna measurements and power meter tests designed to simplify the installation, maintenance and troubleshooting of a wireless networking communication system.


### Additional Measurement Options

The base platform of the E7000L includes the Cable & Antenna measurement mode. Other tools can be added as software-enabled measurement options. Examples follow; see Section 1-3 for a complete list.

- RF Power Meter: includes Internal Power Meter and Inline High Power Meter.
- Optical feedline measurements: includes Optical Power Meter, Visual Fault Locator (VFL), and Fiber Inspection.

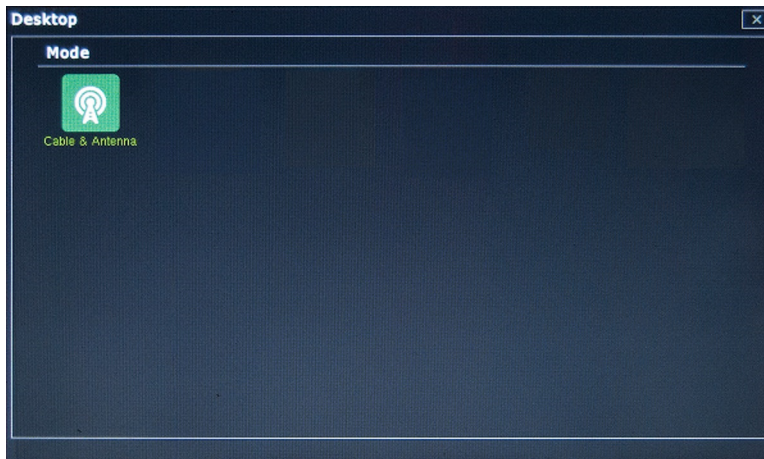
Additional measurement options can be added at the time of purchase, or at a later date as your test needs evolve.

## 2-15 Measurement Mode Selection

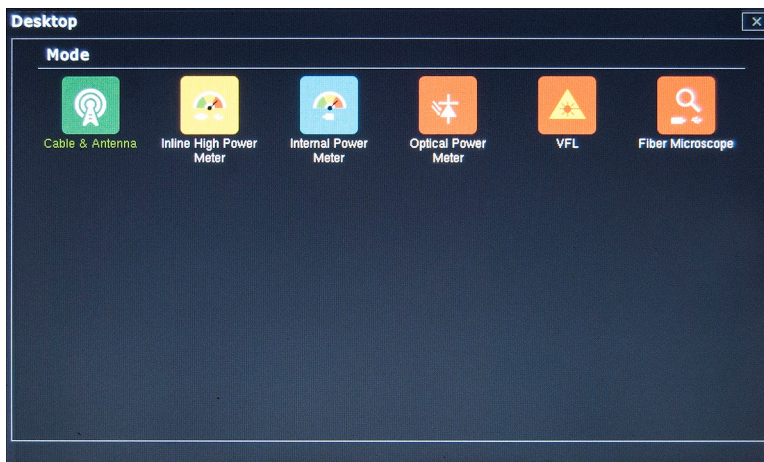
To perform a Cable & Antenna measurement, press the  icon on the toolbar along the top of the touchscreen display. (You can also press the Menu button to the right of the display.) This opens the E7000L desktop function and displays the Cable & Antenna measurement mode.

Optional measurement modes can be installed on your E7000L at the time of purchase, or at a later date as your test needs evolve. When loaded, any optional modes and associated measurement applications will also be displayed on the desktop. Please see Section 1-3 regarding available product measurement options.

To activate a specific measurement, simply tap the desired measurement mode icon.



*SitePROFILER base model*



*SitePROFILER with measurement options enabled*

## 2-16 About the Soft Carrying Case

The E7000L can be operated while in the soft carrying case. On the back of the case is a large storage pouch for accessories and power supply.



*Instrument Inserted into the Soft Carrying Case*

### To place the instrument into the soft carrying case:

1. Place the soft carrying case face-down on a stable surface, with the front panel closed and lying flat.

**NOTE:** The soft case has two zippers near the back. The zipper closest to the front of the case opens, enabling you to install and remove the instrument. The zipper located toward the back of the case opens an adjustable support panel that can be used to provide support for improved stability and air flow while the instrument is in the case. This support panel also contains the storage pouch.

2. Open the zippered back of the case.
3. Insert the instrument face-down into the case. Take care that the connectors fit properly through the opening in the case top.

# Chapter 3 — Calibrating the E7000L

## Introduction

This chapter provides a guide to calibrating the E7000L SitePROFILER's measurement apparatus. Calibration of the E7000L to the Open, Short, and Load standards is important for achieving accurate, reliable results. Measurement calibration should be performed after setting your measurement start and stop frequencies, but prior to making a measurement.

Generally, it is best to calibrate the instrument after turning it on and allowing approximately 10 minutes for warmup.

## 3-1 Calibration Equipment

### 3-1.1 — Manual and Automatic Calibration

The calibration procedure requires one of the following Open, Short, Load (OSL) calibration devices:

- Mechanical "Y" OSL CAL device (manual calibration)
- Electronic eCAL OSL device (automatic calibration)

Please select the device and method that best suit your measurement needs.

#### Manual Calibration

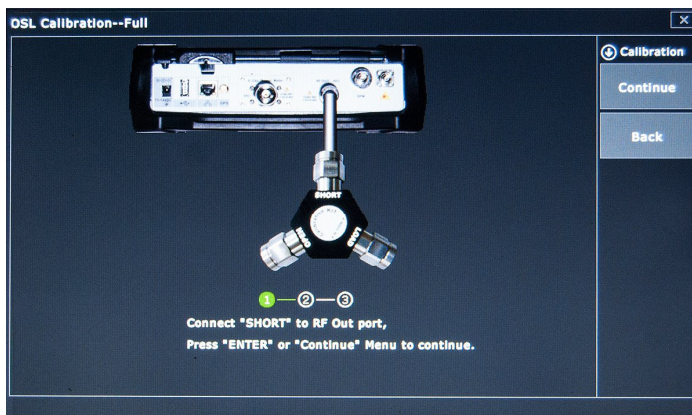
Using the mechanical "Y" OSL CAL device optimizes calibration accuracy and measurement results.

This method requires that you connect the "Y" OSL device to the SitePROFILER and follow a short series of prompts as displayed on the E7000L SitePROFILER, as well as periodically rotating the "Y" calibration device through the Open, Short, and Load positions.

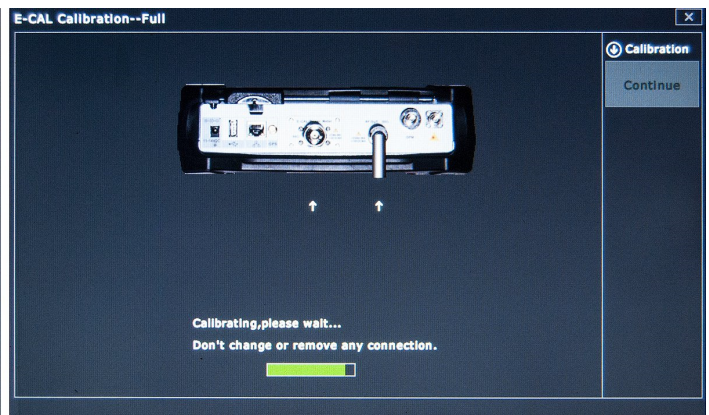
#### Automatic Calibration

The electronic eCAL OSL device offers a quick, automatic solution to the calibration process. Measurement results may suffer some accuracy loss compared to those recorded after a manual calibration.

This method requires that you connect the eCAL OSL device to the SitePROFILER in both the RF Out and USB ports (using a USB-to-mini-USB cable) and press **Start CAL** (located in the instrument's **Calibration** sub-menu). The eCAL OSL device will automatically cycle through the Open, Short, and Load positions.



Manual calibration



Automatic calibration

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### 3-1.2 — Test Port Extension Cable

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Although the SitePROFILER cable analyzer can connect directly to feedline and antenna equipment for testing, in some cell site configurations this can be difficult or unsafe. For this reason, many sweep test applications require the use of a test port extension cable.

**NOTE: In the absence of a test port extension cable, a compatible cable with similar phase stability can be used without negatively impacting measurement results.**

When using a test port extension cable, please note that you must calibrate at the **end** of the cable prior to making a measurement, or any time you disconnect and reconnect the cable.

## 3-2 Performing the Calibration

Once you have selected a calibration method according to Section 3-1, select a type of calibration to perform. In general, it is recommended to choose Standard CAL if you plan on measuring only within a given frequency range; choose Full Span if you plan on measuring within several different frequency ranges and modes.

See the procedure for each type in the subsections below.

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### 3-2.1 — Full Span Calibration

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With the Full Span CAL mode, calibration is performed across the entire frequency range of the instrument. Following a full span calibration, you may freely change measurement mode and frequency range without the need to re-calibrate the instrument between operations.

**Procedure:**

1. Tap the **Calibration** main menu key to open the Calibration submenu.
2. Tap **Cal Method** to toggle between **OSL** (manual) and **E-CAL** (automatic); select the method that corresponds to the calibration device in use. For more details, see Section 3-1.
3. If you selected **OSL** in step 2, toggle **Cal Type** to **Full**.
4. Tap **Start Cal** to begin calibration. Follow the on-screen prompts.

Following a successful full span calibration, "FullSpan Cal ON" will appear in the calibration status tab on the left edge of the display. You may now proceed with measurement operations as needed.

When the instrument is shut down or the test cable is removed, the full span calibration will no longer be valid. "CAL OFF" will appear in the calibration status tab.



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### 3-2.2 — Standard Calibration

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With the Standard CAL mode, calibration is performed only within the frequency range you have defined for your measurement. The standard calibration will apply to all measurement modes, provided that the frequency range in use does not exceed the previously calibrated frequency range.

**NOTE: If the new frequency range is the same as the one for which the instrument was calibrated, the calibration will remain valid. For best test results, keep the new range as close as possible to the old.**

#### Procedure:

1. Tap the **Calibration** main menu key to open the Calibration submenu.
2. Tap **Cal Method** to toggle between **OSL** (manual) and **E-CAL** (automatic); select the method that corresponds to the calibration device in use. For more details, see Section 3-1.
3. If you selected **OSL** in step 2, toggle **Cal Type** to **STD**.
4. Tap **Start Cal** to begin calibration. Follow the on-screen prompts.

Following a successful full span calibration, "Standard ON" will appear in the calibration status tab on the left edge of the display. You may now proceed with measurement operations as needed.

When the instrument is shut down or the test port extension cable disconnected, the full span calibration will no longer be valid. "CAL OFF" will appear in the calibration status tab.

## 3-3 Calibration Correction and Info

The Calibration Correction tool is located in the **Calibration** main menu. Tap **Cal Correct** to turn this function **On** or **Off**. When set to Off, the current calibration status will be saved and temporarily disabled. You will be able to view your measurement without the calibration's adjustments. The calibration will remain valid, and does not need to be repeated; simply toggle Cal Correct to On to re-apply it.

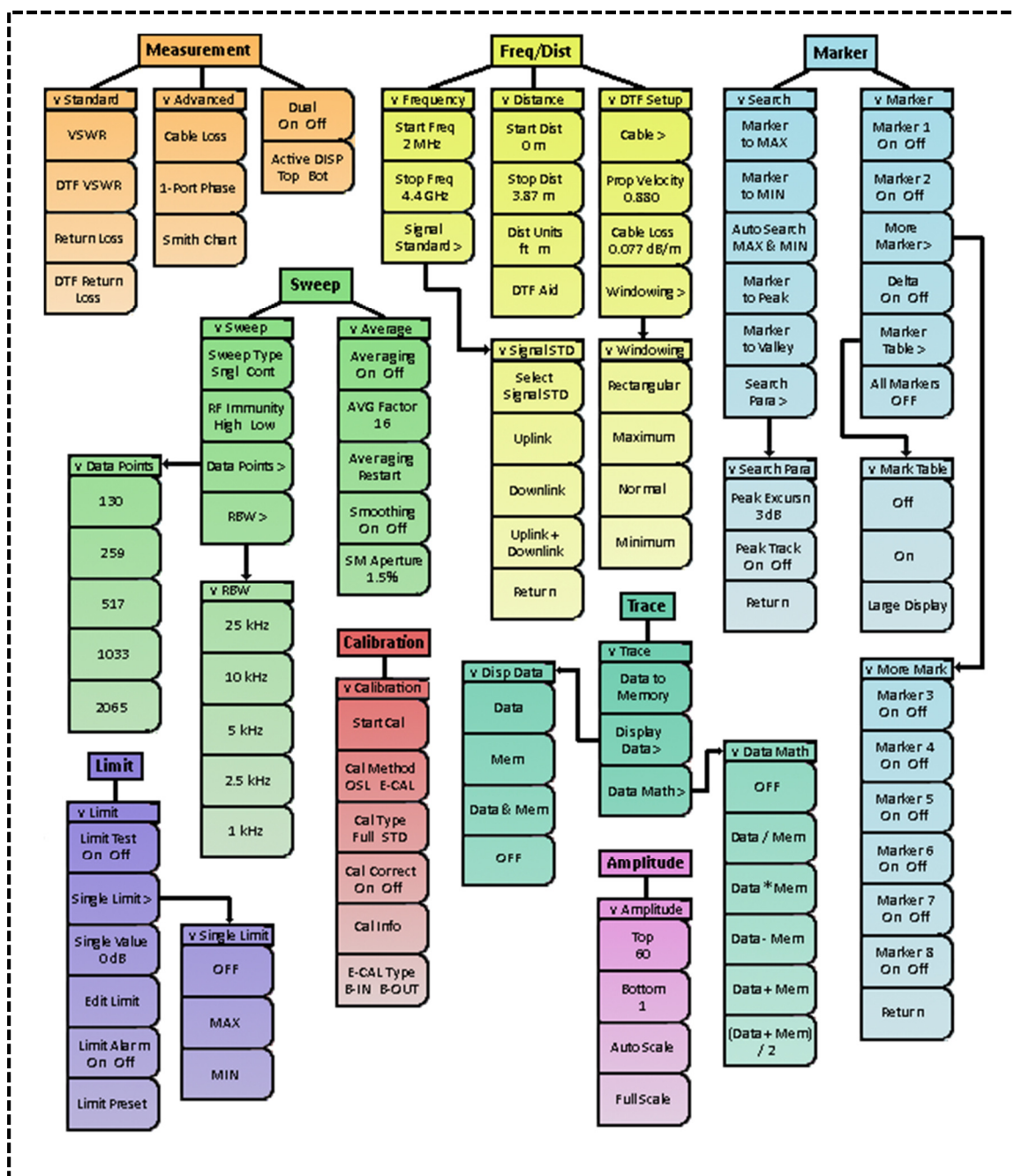
Finally, tap the **Cal Info** softkey to open the information dialog. This screen displays the current instrument settings and active calibration details, including frequency range, calibration type and method, date of the last calibration, device temperature, and temperature range within which the current calibration will remain valid.

## Chapter 4 — Cable Analyzer Menus

This chapter contains maps and descriptions of the E7000L SitePROFILER cable analyzer's menus. Main menus are located along the bottom edge of the display and can be tapped to enter their respective submenus. Submenus are located along the right edge of the display, and are listed in the order they appear.

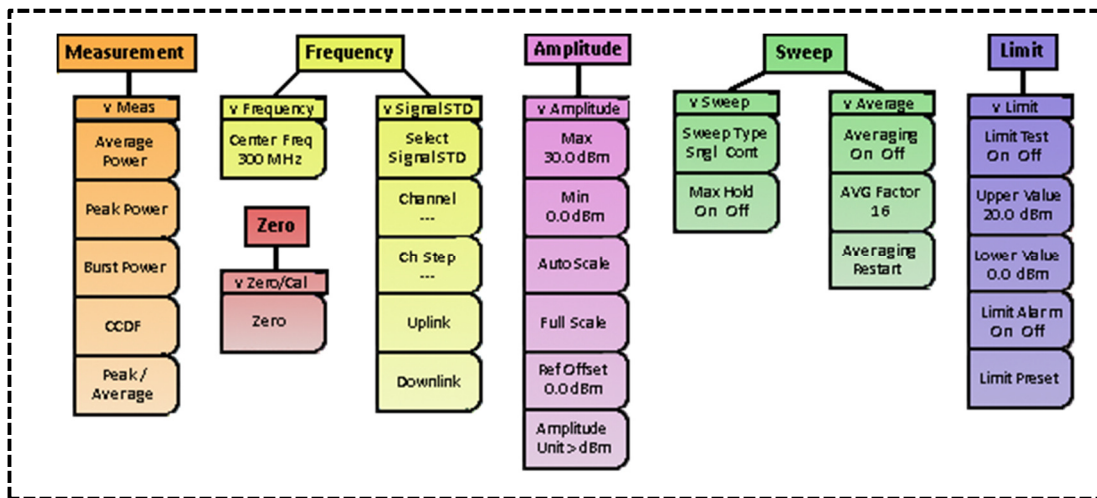
Main menus are indicated with **bold text**. Submenus are indicated with an arrow, ">" indicates a closed (sub)menu. "v" indicates an open (sub)menu, with its contents (with default values) listed below.

### Cable & Antenna Mode Menus

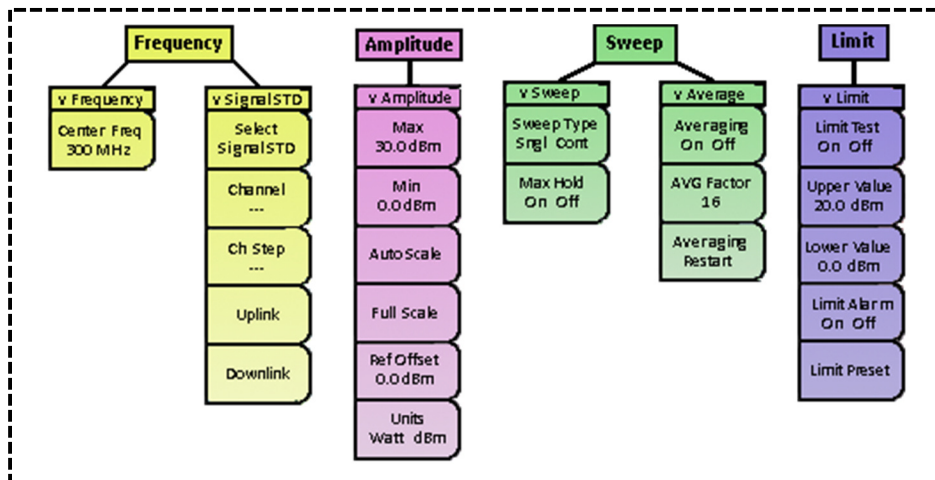




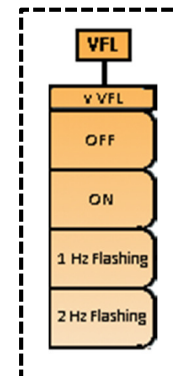
### Inline High Power Meter Mode Menus



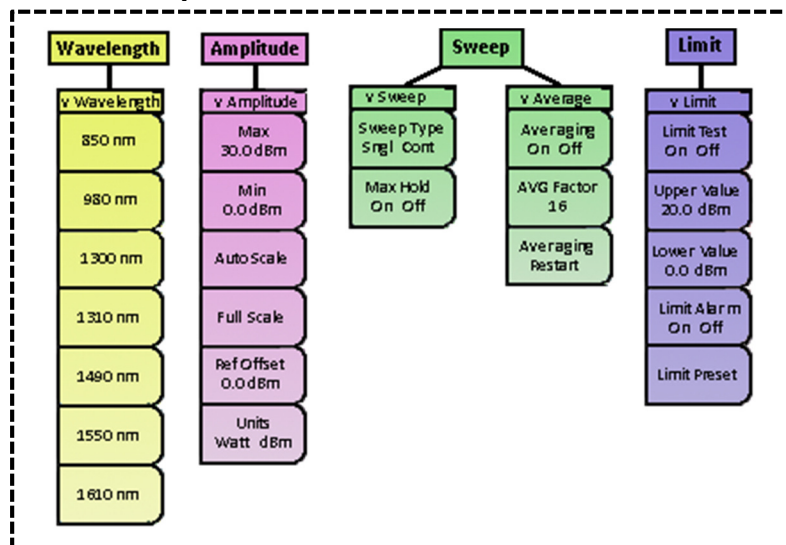
### Internal Power Meter Mode Menus



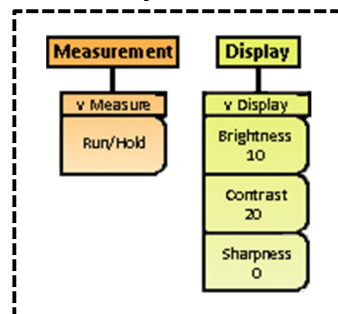
### VFL Main Menu



### Optical Power Meter Main Menus



### Fiber Scope Main Menu





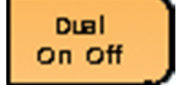

## 4-1 Cable & Antenna Mode: Menus & Definitions


This section defines the **Cable & Antenna** measurement mode's menus and functions. Subsections 4-1.1 through 4-1.8 highlight the main menus available in this mode (**Measurement, Freq/Dist, Amplitude, Calibration, Marker, Limit, Sweep, and Trace**), along with their corresponding submenus.

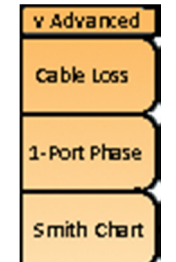
For information on shortcut menus (those denoted on the data keypad as secondary functions), please refer to Section 4-6.

### 4-1.1 — Measurement Menu

The **Measurement main menu** contains cable & antenna measurement applications, including Return Loss, VSWR, and Distance-to-Fault.


	<p><b>Standard:</b> Opens and closes the Standard measurements submenu.</p>
	<p><b>Advanced:</b> Opens and closes the Advanced measurements submenu.</p>
	<p><b>Dual:</b> Tap to toggle dual view <b>On</b> or <b>Off</b>. In dual view, you can view two different Cable &amp; Antenna measurements at the same time; the display will split horizontally, showing one measurement on top and one on bottom. Toggle Off to return to the single measurement view.</p>
	<p><b>Active DISP:</b> Tap to toggle between managing the <b>top</b>-displayed measurement and the <b>bottom</b>-displayed measurement. In dual view, the active measurement is outlined in white. When activating a new measurement from the Standard or Advanced submenus, the change will only affect the currently active measurement display. (You can toggle between your two measurements even when <b>Dual</b> is set to <b>Off</b>.)</p>

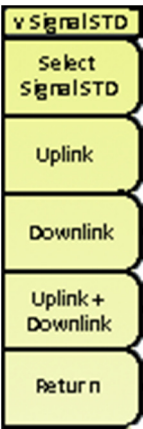
	<p><b>Standard Measurements Submenu</b></p> <p><b>VSWR:</b> Activates the Voltage Standing Wave Ratio measurement. See Chapter 6 for details.</p> <p><b>DTF VSWR:</b> Activates the Distance-to-Fault VSWR measurement. See Chapter 7 for details.</p> <p><b>Return Loss:</b> Activates the Return Loss measurement. See Section Chapter 5 for details.</p> <p><b>DTF Return Loss:</b> Activates the Distance-to-Fault Return Loss measurement. See Chapter 7 for details.</p>
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	<p><b>Advanced Measurements Submenu</b></p> <p><b>Cable Loss:</b> Activates the One Port Cable Loss measurement. See Chapter 8 for details.</p> <p><b>1-Port Phase:</b> Activates the One Port Phase measurement. See Chapter 9 for details.</p> <p><b>Smith Chart:</b> Activates the Smith Chart measurement. See Chapter 10 for details.</p>
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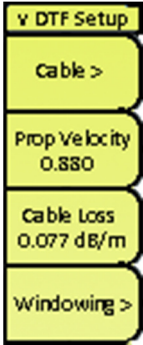
## 4-1.2 — Freq/Dist Menu

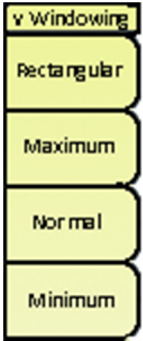
The **Frequency and Distance main menu** contains frequency range and signal standard parameters, as well as distance-to-fault measurement options.

	<b>Frequency Submenu</b>
	<b>Start Freq:</b> Sets the start frequency of the current measurement. Use the arrow keys, rotary knob, or data keypad to input a value. If prompted, tap to select a unit (Hz, kHz, MHz or GHz).
	<b>Stop Freq:</b> Sets the stop frequency of the current measurement. Use the arrow keys, rotary knob, or data keypad to input a value. If prompted, tap to select a unit (Hz, kHz, MHz or GHz).
	<b>Signal Standard:</b> Opens and closes the Signal Standard submenu. (See next table.)

	<b>Signal Standard Submenu</b>
	<b>Select Signal STD:</b> Opens the Signal Standard selection dialog: a list of commonly-used signal standards and their frequency ranges. Select standards using the arrow keys or rotary knob, then tap the <b>Select/Deselect</b> softkey to place a star (*) next to them. You can view only starred signals by toggling <b>Display</b> from <b>All</b> to <b>Sltd</b> . Tap <b>Search</b> to search for a given standard by name, using the data keypad. If a USB storage device is connected to the instrument, you can also transfer saved signal standard settings to and from USB. Press the <b>Esc</b> button to exit the dialog.
	<b>Uplink:</b> Tap to indicate a signal being transmitted to the antenna.
	<b>Downlink:</b> Tap to indicate a signal being received at the cell tower.
	<b>Uplink + Downlink:</b> Tap to indicate both uplink and downlink signals.
	<b>Return:</b> Tap to return to the <b>Freq/Dist</b> main menu.


	<b>Distance Submenu</b>
	<b>Start Dist:</b> Sets how far down the cable to start the measurement. Use the arrow keys, rotary knob, or data keypad to input a value. If prompted, tap to select a unit (Hz, kHz, MHz or GHz).
	<b>Stop Freq:</b> Sets how far down the cable to stop the measurement. Use the arrow keys, rotary knob, or data keypad to input a value. If prompted, tap to select a unit (Hz, kHz, MHz or GHz).
	<b>Dist Units:</b> Tap to toggle the default distance unit between <b>feet</b> (ft) and <b>meters</b> (m).
	<b>DTF Aid:</b> Opens the DTF Aid screen. Here you can find information and helpful tips for Distance-to-Fault measurements, as well as the current status of all DTF-related parameters. Double-tap one of the tabs on the left side of the display to change its value or see advice on best settings. Press the <b>Esc</b> button to cancel editing a value. Press Esc again to exit DTF Aid.

	<b>DTF Setup Submenu</b>	
	<b>Cable:</b>	Opens the Cable selection dialog: a list of commonly-used cables and their prop velocity and cable loss per foot at various frequencies. Select cables using the arrow keys or rotary knob, then tap the <b>Select/Deselect</b> softkey to place a star (*) next to them. You can view only starred signals by toggling <b>Display</b> from <b>All</b> to <b>Slt'd</b> . Tap <b>Search</b> to search for a given cable by name, using the data keypad. If a USB storage device is connected to the instrument, you can also transfer saved cable settings to and from USB. Press the <b>Esc</b> button to exit the dialog
	<b>Prop Velocity:</b>	Inputs the cable propagation velocity of the cable used in your measurement.
	<b>Cable Loss:</b>	Inputs the cable loss of the cable used in your measurement.
	<b>Windowing:</b>	Opens the Windowing submenu. (See next table.)

	<b>Windowing submenu</b>	
	<b>Rectangular:</b>	Adjusts measurement view to maximize both peak resolution and side-lobe levels.
	<b>Maximum:</b>	Adjusts measurement view to show somewhat lower peak resolution and side-lobe levels than Rectangular windowing.
	<b>Normal:</b>	Adjusts measurement view to show somewhat higher peak resolution and side-lobe levels than Minimum windowing.
	<b>Minimum:</b>	Adjusts measurement view to minimize both peak resolution and side-lobe levels.

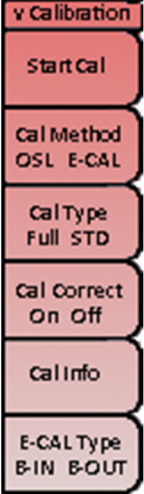
4-1.3 — Amplitude Menu

The **Amplitude main menu** contains amplitude and scaling parameters.

	<b>Amplitude Menu</b>	
	<b>Top:</b>	Sets the amplitude level at the top of the measurement display, in dB.
	<b>Bottom:</b>	Sets the amplitude level at the bottom of the measurement display, in dB.
	<b>Auto Scale:</b>	Automatically adjusts the scale to recommended range for the current measurement.
	<b>Full Scale:</b>	Automatically adjusts the scale to maximum range for the current measurement.

## 4-1.4 — Calibration Menu

The **Calibration main menu** allows the user to calibrate the E7000L SitePROFILER when either a "Y" OSL CAL or eCAL device is connected to the instrument. You can also view or set calibration options here.

	<b>Calibration Menu</b>
	<b>Start Cal:</b> Initiates the calibration process. See Chapter 3 for more information on this procedure and compatible calibration devices.
	<b>Cal Method:</b> Tap to toggle between calibration methods, dependent on the connected device.
	<b>Cal Type:</b> Tap to toggle between Full Span and Standard calibration. See Section 3-2.
	<b>Cal Correct:</b> Tap to toggle the Calibration Correct function <b>On/Off</b> . Calibrate your instrument, then toggle this function Off to view your measurement without the calibration's adjustments. Even when Off, the calibration will remain valid; toggle On to re-apply it.
	<b>Cal Info:</b> Opens the Calibration Info screen. This screen displays the current instrument settings and active calibration details.
	<b>E-CAL Type:</b> Toggles the E-CAL type. <ul style="list-style-type: none"> <li>• If it is connected via the RF Out and E-CAL/Power Meter ports, choose <b>B-IN</b>.</li> <li>• If the E-CAL device is connected via the instrument's RF Out and USB ports, choose <b>B-OUT</b>. This option only appears when Cal Method (above) is set to E-CAL.</li> </ul>



4-1.5 — Marker Menu

The **Marker main menu** contains various tools for activating, setting, and moving up to eight markers on the measurement display. For more information, see Section 16-1.

<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">v Marker</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker 1 On Off</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker 2 On Off</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">More Marker &gt;</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Delta On Off</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker Table &gt;</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">All Markers OFF</div>	<p><b>Marker Submenu</b></p> <p><b>Marker 1:</b> Tap to turn Marker 1 <b>On/Off</b>. Toggling On also makes this the active marker.</p> <p><b>Marker 2:</b> Tap to turn Marker 2 <b>On/Off</b>. Toggling On also makes this the active marker.</p> <p><b>More Marker:</b> Opens a submenu containing On/Off controls for Markers 3 through 8.</p> <p><b>Delta:</b> Tap to toggle delta markers <b>On/Off</b>. When On, a delta marker corresponding to the active normal marker is created. When the delta marker is set, it becomes the reference position of the normal marker; the marker's X and Y values display the difference between the markers' positions.</p> <p><b>Marker Table:</b> Opens the Marker Table submenu. (See next table.)</p> <p><b>All Markers OFF:</b> Hides all currently placed markers from view. Their places are recorded; turn a marker back on and it will reappear at its previous position.</p>
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<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">v Mark Table</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Off</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">On</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Large Display</div>	<p><b>Mark Table Submenu</b></p> <p><b>Off:</b> Tap to hide the Marker Table.</p> <p><b>On:</b> Tap to display the Marker Table. A table of all placed markers will pop up below the measurement display, including their current numerical positions, the current measurement at that spot, and their delta positions and measurements.</p> <p><b>Large Display:</b> Tap to display the active marker's numerical position and measurement in large, easily-visible type.</p>
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<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">v Search</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker to MAX</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker to MIN</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Auto Search MAX &amp; MIN</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker to Peak</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker to Valley</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Search Para &gt;</div>	<p><b>Search Submenu</b></p> <p><b>Marker to MAX:</b> Moves the active marker to the location of current highest amplitude.</p> <p><b>Marker to MIN:</b> Moves the active marker to the location of current lowest amplitude.</p> <p><b>Auto Search MAX &amp; MIN:</b> Searches the current measurement, and moves the active marker to highest and lowest amplitudes. Edit sensitivity of this function by setting <b>Fault Threshold</b>. (See next table.)</p> <p><b>Marker to Peak:</b> Moves the active marker to the next (to right) peak in the measurement trace.</p> <p><b>Marker to Valley:</b> Moves the active marker to the next (to right) valley in the measurement trace.</p> <p><b>Search Para:</b> Opens the Search Para submenu. (See next table.)</p>
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v Search Para	Search Para Submenu
Peak Excursion 3dB	<b>Peak Excursion:</b> Modifies how large a spike in the measurement trace must be before the instrument interprets it as a peak.
Peak Track On Off	<b>Fault Threshold:</b> Modifies how large a peak must be before the instrument interprets it as a potential fault point.
Return	<b>Peak Track:</b> Tap to toggle the Peak Track function <b>On/Off</b> . When on, the current active marker will automatically move to follow the highest point on the measurement trace.
	<b>Return:</b> Tap to return to the Marker main menu.

#### 4-1.6 — Limit Menu


The **Limit main menu** contains various tools for activating and setting up to ten upper or lower limit lines on the measurement display. For more information, see Section 16-2.

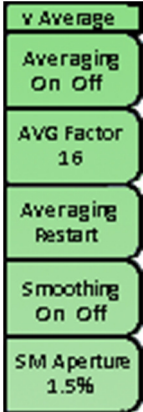
v Limit	Limit Submenu
Limit Test On Off	<b>Limit Test:</b> Tap to toggle the Limit Test function <b>On/Off</b> . When On, the instrument will compare the current measurement to user-defined limit lines. If the measurement breaches a limit line, the text "FAIL" will appear in large red text, and the exceeding region will be colored red.
Single Limit >	<b>Single Limit:</b> Opens the Single Limit submenu. (See next table.)
Single Value 0dB	<b>Single Value:</b> Sets the position of the single upper or lower limit line specified in the Single Limit submenu. (See next table.)
Edit Limit	<b>Edit Limit:</b> Opens the Edit Limit dialog. Here, you can freely add, define, and delete a maximum of 10 limit lines.
Limit Alarm On Off	<b>Limit Alarm:</b> Tap to toggle the Limit Alarm feature <b>On/Off</b> . When on, the instrument will emit a series of beeps to notify the user when a limit line is breached.
Limit Preset	<b>Limit Preset:</b> Resets to default settings; turns all limits off.

v Single Limit	Single Limit Submenu
OFF	<b>OFF:</b> Tap to deactivate the default limit line.
MAX	<b>MAX:</b> Tap to set an upper limit. If the measurement goes higher than the limit, "FAIL" is displayed.
MIN	<b>MIN:</b> Tap to set a lower limit. If the measurement goes lower than the limit, "FAIL" is displayed.

4-1.7 — Sweep Menu


Access the Sweep menu by pressing the **Sweep** (#3) key on the data keypad to the right of the display. The **Sweep menu** allows the user to set the sweep type, speed, resolution, and various averaging functions.


	<p><b>Sweep Submenu</b></p> <p><b>Sweep Type:</b> Tap to toggle between <b>Single</b>, where the instrument will perform a single sweep and then pause, and <b>Continuous</b>, where the instrument will initiate a new sweep as soon as the previous sweep is completed.</p> <p><b>RF Immunity:</b> Tap to toggle the degree to which the instrument will reject RF interference in its measurement. Choose <b>High</b> or <b>Low</b>, depending upon the needs of your measurement.</p> <p><b>Data Points:</b> Opens a submenu for setting the number of data points in the measurement: 130, 259, 517, 1033, or 2065. The default setting is 259 points. If your measurement involves a wide frequency range and/or high accuracy (e.g., a DTF test), more data points are recommended. Be aware that the larger the number of data points, the longer the instrument will take to conduct a sweep.</p> <p><b>RBW:</b> Opens a submenu for setting the resolution bandwidth in the measurement. You may choose 1, 2.5, 5, 10, or 25 kHz. The default setting is 2.5 kHz.</p>
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	<p><b>Average Submenu</b></p> <p><b>Averaging:</b> Tap to toggle the averaging function <b>On/Off</b>. When On, the measurement acquires additional samples at each frequency (or power) point and performs the averaging process. Since this lessens the time between sample acquisitions, averaging is best for removing high rate noise.</p> <p><b>Averaging (AVG) Factor:</b> Sets the number of measurements performed at each frequency point when averaging is On, from 1 - 999. The default value is 16.</p> <p><b>Averaging Restart:</b> Tap to restart the collection and per-point averaging of measurement data.</p> <p><b>Smoothing:</b> Tap to toggle the trace smoothing function <b>On/Off</b>. Trace smoothing performs a weighted averaging around each frequency point. Note that, since this process combines data at different frequency points, it can remove valid measurement data and should be used with care.</p> <p><b>Smoothing (SM) Aperture:</b> Sets the magnitude of the smoothing function, from 0.1% – 20%.</p>
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## 4-1.8 — Trace Menu

Access the Trace menu by pressing the **Trace** (#5) key on the data keypad to the right of the display. The **Trace menu** allows the user to compare the current measurement trace to a trace saved to the instrument's internal memory, performing a variety of mathematical comparison functions.

	<b>Trace Menu</b>	
		<b>Data to Memory:</b> Records the current measurement trace into the “Mem” slot in the instrument's internal memory. Any trace comparisons from this point will be between the new trace and the one recorded as “Mem”.
		<b>Display Data:</b> Opens the Display Data submenu.
		<b>Data Math:</b> Opens the Data Math submenu.

	<b>Display Data Submenu</b>	
		<b>Data:</b> Tap to show the current measurement trace (in yellow) on the display.
		<b>Mem:</b> Tap to show the saved measurement trace (in blue) on the display.
		<b>Data &amp; Mem:</b> Tap to show the current and saved measurement traces simultaneously.
		<b>OFF:</b> Tap to turn off all measurement traces, leaving a blank grid.



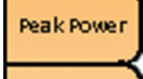
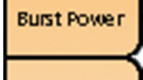

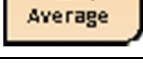
	<b>Data Math Submenu</b>	
		<b>OFF:</b> Tap to disable the activated Data Math function.
		<b>Data / Mem:</b> Shows the quotient of the current trace divided by the saved trace.
		<b>Data * Mem:</b> Shows the product of the current trace multiplied by the saved trace.
		<b>Data - Mem:</b> Shows the difference of the saved trace subtracted from the current trace.
		<b>Data + Mem:</b> Shows the sum of the current trace added to the saved trace.

## 4-2 Inline High Power Meter Mode: Menus & Definitions

This section defines the **Inline High Power Meter** measurement mode's menus and functions. Subsections 4-2.1 through 4-2.6 highlight the main menus available in this mode (**Measurement, Frequency, Amplitude, Zero, Sweep, and Limit**), along with their corresponding submenus. The external power sensor (PN: E7000A-00500) is necessary for effective use of this measurement mode.


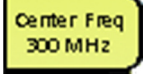
### 4-2.1 — Measurement Menu



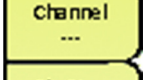
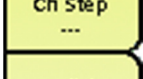
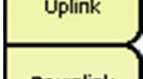
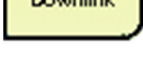
The **Measurement main menu** contains inline high power measurement settings, including average power, burst power, and Complementary Cumulative Distribution Function (CCDF).

Measurement Menu	
	
	<b>Average Power:</b> Depicts the mean power reading calculated over several cycles, as indicated by the yellow needle on the display.
	<b>Peak Power:</b> Depicts the maximum instantaneous power reading, as indicated by the yellow needle on the display.
	<b>Burst Power:</b> Depicts time-gated burst power readings and the duty cycle (the percentage of time the signal is on. E.g., for 0.5-second bursts that begin every 1.0 second, the duty cycle is 50%.)
	<b>CCDF:</b> Depicts the percentage of time the power reading meets or exceeds a specific power level.
	<b>Peak / Average (PAR):</b> Displays the ratio of the peak measured power level to the time-averaged power level.

### 4-2.2 — Frequency Menu

The **Frequency main menu** contains the center frequency parameter, as well as signal standard selection.

Frequency Submenu	
	
	<b>Center Frequency:</b> Sets the midpoint of the frequency range for the current measurement. Input a value using the arrow keys, rotary knob, or data keypad, then select a unit (Hz, kHz, MHz or GHz).

Signal Standard Submenu	
	
	<b>Select Signal STD:</b> : Opens the Signal Standard selection dialog: a list of commonly-used signal standards and their frequency ranges. Select standards using the arrow keys or rotary knob, then tap the <b>Select/Deselect</b> softkey to place a star (*) next to them. You can view only starred signals by toggling <b>Display</b> from <b>All</b> to <b>Sltd</b> . Tap <b>Search</b> to search for a given standard by name, using the data keypad. If a USB storage device is connected to the instrument, you can also transfer saved signal standard settings to and from USB. Press the <b>Esc</b> button to exit the dialog.
	<b>Channel:</b> Sets a specific channel to test.
	<b>Ch Step:</b> Sets the channel step size. Enter "1" to test each channel one by one.
	<b>Uplink:</b> Tap to indicate a signal being transmitted to the antenna.
	<b>Downlink:</b> Tap to indicate a signal being received at the cell tower.

### 4-2.3 — Amplitude Menu

The **Amplitude main menu** contains amplitude, scaling, and reference level offset parameters.

	<b>Amplitude Menu</b>	
	<b>Max:</b>	Sets the amplitude level at the top of the measurement display.
	<b>Min:</b>	Sets the amplitude level at the bottom of the measurement display.
	<b>Auto Scale:</b>	Automatically adjusts the scale to recommended range for the current measurement.
	<b>Full Scale:</b>	Automatically adjusts the scale to the maximum range for the current measurement.
	<b>Ref Offset:</b>	Sets the reference level. Using the arrow keys, rotary knob, or data keypad, enter a value to compensate for the presence of external input attenuation or gain.
	<b>Units:</b>	Tap to toggle the active amplitude unit between <b>Watt</b> and <b>dBm</b> .

### 4-2.4 — Zero Menu

The **Zero main menu** contains the Zero command, which removes system noise from the measurement.

	<b>Zero/Cal Submenu</b>	
	<b>Zero:</b>	Tap to perform the Zero operation, removing system noise from the measurement.

### 4-2.5 — Sweep Menu


The **Sweep menu** allows the user to set the sweep type, hold setting, and various averaging functions.

	<b>Sweep Submenu</b>	
	<b>Sweep Type:</b>	Tap to toggle between <b>Single</b> , where the instrument will perform a single sweep and then pause, and <b>Continuous</b> , where the instrument will initiate a new sweep as soon as the previous sweep is completed.
	<b>Max Hold:</b>	Freezes the measurement at its highest reading so far.

	<b>Average Submenu</b>	
	<b>Averaging:</b>	Tap to toggle the averaging function <b>On/Off</b> . When On, the measurement acquires additional samples at each frequency (or power) point and performs the averaging process. Since this lessens the time between sample acquisitions, averaging is best for removing high rate noise.
	<b>Averaging (AVG) Factor:</b>	Sets the number of measurements performed at each frequency point when averaging is On, from 1 - 999. The default value is 16.
	<b>Averaging Restart:</b>	Tap to restart the collection and per-point averaging of measurement data.

4-2.6 — Limit Menu

The **Limit main menu** contains various tools for activating and setting an upper and lower limit line on the measurement display. The area of the meter between user-defined limit lines (i.e., the “pass” region) will be colored green. For more information, see Section 16-2.



	<b>Limit Menu</b>
	<p><b>Limit Test:</b> Tap to toggle the Limit Test function <b>On/Off</b>. When On, the instrument will compare the current measurement to user-defined limit lines. If the measurement breaches a limit line, the text “FAIL” will appear in large red text. Failing regions are colored red, and the passing region green.</p>
	<p><b>Upper Value:</b> Sets the position of an upper limit line. If the measurement goes higher than the limit, “FAIL” is displayed. Set this value to 0 to turn the upper limit off.</p>
	<p><b>Lower Value:</b> Sets the position of a lower limit line. If the measurement goes lower than the limit, “FAIL” is displayed. Set this value to 0 to turn the lower limit off.</p>
	<p><b>Limit Alarm:</b> Tap to toggle the Limit Alarm feature <b>On/Off</b>. When on, the instrument will emit a series of beeps to notify the user when a limit line is breached.</p>
	<p><b>Limit Preset:</b> Resets to default settings; turns all limits off.</p>

## 4-3 Internal Power Meter Mode: Menus & Definitions

This section defines the **Internal Power Meter** measurement mode's menus and functions. Subsections 4-3.1 through 4-3.4 highlight the main menus available in this mode (**Frequency**, **Amplitude**, **Sweep**, and **Limit**), along with their corresponding submenus.

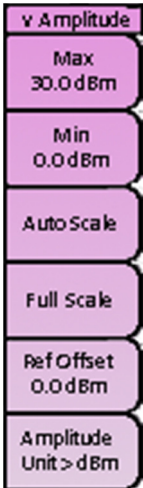
### 4-3.1 — Frequency Menu

The **Frequency main menu** contains the center frequency parameter, as well as signal standard selection.

	<b>Frequency Submenu</b> <b>Center Frequency:</b> Sets the midpoint of the frequency range for the current measurement. Input a value using the arrow keys, rotary knob, or data keypad, then select a unit (Hz, kHz, MHz or GHz).
	<b>Signal Standard Submenu</b> <b>Select Signal STD:</b> : Opens the Signal Standard selection dialog: a list of commonly-used signal standards and their frequency ranges. Select standards using the arrow keys or rotary knob, then tap the <b>Select/Deselect</b> softkey to place a star (*) next to them. You can view only starred signals by toggling <b>Display</b> from <b>All</b> to <b>Sltd</b> . Tap <b>Search</b> to search for a given standard by name, using the data keypad. If a USB storage device is connected to the instrument, you can also transfer saved signal standard settings to and from USB. Press the <b>Esc</b> button to exit the dialog. <b>Channel:</b> Sets a specific channel to test. <b>Ch Step:</b> Sets the channel step size. Enter "1" to test each channel one by one. <b>Uplink:</b> Tap to indicate a signal being transmitted to the antenna. <b>Downlink:</b> Tap to indicate a signal being received at the cell tower.

### 4-3.2 — Amplitude Menu


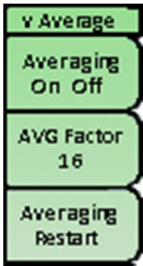
The **Amplitude main menu** contains amplitude, scaling, and reference level offset parameters.

	<b>Amplitude Menu</b> <b>Max:</b> Sets the amplitude level at the top of the measurement display. <b>Min:</b> Sets the amplitude level at the bottom of the measurement display. <b>Auto Scale:</b> Automatically adjusts the scale to recommended range for the current measurement. <b>Full Scale:</b> Automatically adjusts the scale to maximum range for the current measurement. <b>Ref Offset:</b> Sets the reference level. Using the arrow keys, rotary knob, or data keypad, enter a value to compensate for the presence of external input attenuation or gain. <b>Units:</b> Tap to toggle the active amplitude unit between <b>Watt</b> and <b>dBm</b> .
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### 4-3.3 — Sweep Menu

The **Sweep menu** allows the user to set the sweep type, hold setting, and various averaging functions.

	<b>Sweep Submenu</b>	
		<p><b>Sweep Type:</b> Tap to toggle between <b>Single</b>, where the instrument will perform a single sweep and then pause, and <b>Continuous</b>, where the instrument will initiate a new sweep as soon as the previous sweep is completed.</p> <p><b>Max Hold:</b> Freezes the measurement at its highest reading so far.</p>
	<b>Average Submenu</b>	
		<p><b>Averaging:</b> Tap to toggle the averaging function <b>On/Off</b>. When On, the measurement acquires additional samples at each frequency (or power) point and performs the averaging process. Since this lessens the time between sample acquisitions, averaging is best for removing high rate noise.</p>
		<p><b>Averaging (AVG) Factor:</b> Sets the number of measurements performed at each frequency point when averaging is On, from 1 - 999. The default value is 16.</p>
		<p><b>Averaging Restart:</b> Tap to restart the collection and per-point averaging of measurement data.</p>

### 4-3.4 — Limit Menu

The **Limit main menu** contains various tools for activating and setting an upper and lower limit line on the measurement display. The area of the meter between user-defined limit lines (i.e., the “pass” region) will be colored green. For more information, see Section 16-2.

	<b>Limit Menu</b>	
		<p><b>Limit Test:</b> Tap to toggle the Limit Test function <b>On/Off</b>. When On, the instrument will compare the current measurement to user-defined limit lines. If the measurement breaches a limit line, the text “FAIL” will appear in large red text. Failing regions are colored red, and the passing region green.</p>
		<p><b>Upper Value:</b> Sets the position of an upper limit line. If the measurement goes higher than the limit, “FAIL” is displayed. Set this value to 0 to turn the upper limit off.</p>
		<p><b>Lower Value:</b> Sets the position of a lower limit line. If the measurement goes lower than the limit, “FAIL” is displayed. Set this value to 0 to turn the lower limit off.</p>
		<p><b>Limit Alarm:</b> Tap to toggle the Limit Alarm feature <b>On/Off</b>. When on, the instrument will emit a series of beeps to notify the user when a limit line is breached.</p>
		<p><b>Limit Preset:</b> Resets to default settings; turns all limits off.</p>

## 4-4 Optical Power Meter Mode: Menus & Definitions

This section defines the **Optical Power Meter** measurement mode's menus and functions. Subsections 4-3.1 through 4-3.4 highlight the main menus available in this mode (**Wavelength**, **Amplitude**, **Sweep**, and **Limit**), along with their corresponding submenus.

### 4-4.1 — Wavelength

From the **Wavelength main menu**, you can adjust the OPM's wavelength sensitivity.

Wavelength	Wavelength Menu
850 nm	<p><b>Wavelength:</b> Select a value to set the wavelength at which the optical power meter will conduct measurements.</p> <p>Seven different calibrated wavelengths are available.</p>
980 nm	
1300 nm	
1310 nm	
1490 nm	
1550 nm	
1610 nm	


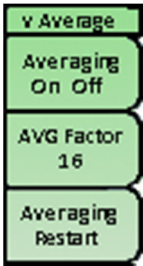
### 4-4.2 — Amplitude Menu

The **Amplitude main menu** contains amplitude, scaling, and reference level offset parameters.

Amplitude	Amplitude Menu
Max 30.0 dBm	<b>Max:</b> Sets the amplitude level at the top of the measurement display.
Min 0.0 dBm	<b>Min:</b> Sets the amplitude level at the bottom of the measurement display.
Auto Scale	<b>Auto Scale:</b> Automatically adjusts the scale to recommended range for the current measurement.
Full Scale	<b>Full Scale:</b> Automatically adjusts the scale to maximum range for the current measurement.
Ref Offset 0.0 dBm	<b>Ref Offset:</b> Sets the reference level. Using the arrow keys, rotary knob, or data keypad, enter a value to compensate for the presence of external input attenuation or gain.
Amplitude Unit > dBm	<b>Units:</b> Tap to toggle the active amplitude unit between <b>Watt</b> and <b>dBm</b> .


### 4-4.3 — Sweep Menu

The **Sweep menu** allows the user to set the sweep type, hold setting, and various averaging functions.

	<b>Sweep Submenu</b>	
	<p><b>Sweep Type:</b> Tap to toggle between <b>Single</b>, where the instrument will perform a single sweep and then pause, and <b>Continuous</b>, where the instrument will initiate a new sweep as soon as the previous sweep is completed.</p>	
	<p><b>Max Hold:</b> Freezes the measurement at its highest reading so far.</p>	
	<b>Average Submenu</b>	
	<p><b>Averaging:</b> Tap to toggle the averaging function <b>On/Off</b>. When On, the measurement acquires additional samples at each frequency (or power) point and performs the averaging process. Since this lessens the time between sample acquisitions, averaging is best for removing high rate noise.</p>	
	<p><b>Averaging (AVG) Factor:</b> Sets the number of measurements performed at each frequency point when averaging is On, from 1 - 999. The default value is 16.</p>	
	<p><b>Averaging Restart:</b> Tap to restart the collection and per-point averaging of measurement data.</p>	

### 4-4.4 — Limit Menu

The **Limit main menu** contains various tools for activating and setting an upper and lower limit line on the measurement display. The area of the meter between user-defined limit lines (i.e., the “pass” region) will be colored green. For more information, see Section 16-2.

	<b>Limit Menu</b>	
	<p><b>Limit Test:</b> Tap to toggle the Limit Test function <b>On/Off</b>. When On, the instrument will compare the current measurement to user-defined limit lines. If the measurement breaches a limit line, the text “FAIL” will appear in large red text. Failing regions are colored red, and the passing region green.</p>	
	<p><b>Upper Value:</b> Sets the position of an upper limit line. If the measurement goes higher than the limit, “FAIL” is displayed. Set this value to 0 to turn the upper limit off.</p>	
	<p><b>Lower Value:</b> Sets the position of a lower limit line. If the measurement goes lower than the limit, “FAIL” is displayed. Set this value to 0 to turn the lower limit off.</p>	
	<p><b>Limit Alarm:</b> Tap to toggle the Limit Alarm feature <b>On/Off</b>. When on, the instrument will emit a series of beeps to notify the user when a limit line is breached.</p>	
	<p><b>Limit Preset:</b> Resets to default settings; turns all limits off.</p>	

## 4-5 Visual Fault Locator (VFL) Mode: Menus & Definitions

This section defines the **Optical Power Meter** measurement mode's menu functions. Subsection 4-5.1 highlights the single main menu available in this mode (**VFL**).

### 4-5.1 — VFL Menu

The **Limit main menu** contains controls for the Visual Fault Locator light beam, which is emitted from the VFL port on the instrument's top panel. Unscrew and remove the metal cap over this port, then connect the fiber for fault location to the port to use the light.

**NOTE: The beam emitted by the VFL can cause vision damage. For your safety, do not look directly at the light beam for extended periods of time.**

V VFL	<b>VFL Menu</b>
OFF	<b>OFF:</b> Switches the fault locator light off.
ON	<b>ON:</b> Switches the fault locator light on. The light will shine continuously.
1 Hz Flashing	<b>1 Hz Flashing:</b> The fault locator light will flash on and off at a rate of 1 flash per second.
2 Hz Flashing	<b>2 Hz Flashing:</b> The fault locator light will flash on and off at a rate of 2 flashes per second.

## 4-6 Fiber Microscope Mode: Menus & Definitions


This section defines the **Fiber Microscope** measurement mode's menu functions. Subsections 4-6.1 and 4-6.2 highlight the main menus available in this mode (**Measurement** and **Display**).

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### 4-6.1 — Measurement Menu

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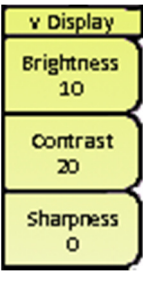
The **Measurement main menu** contains a Run/Hold control for the fiber probe's video feed.

	<p><b>Measure Menu</b></p> <p><b>Run/Hold:</b> Tap to toggle. <b>Hold</b> pauses the measurement display at its current point, and <b>Run</b> unpauses it to continue the real-time measurement.</p>
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### 4-6.2 —Display Menu

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	<p><b>Display Menu</b></p> <p><b>Brightness:</b> Sets the brightness of the video feed. Use the arrow keys, rotary knob, or data keypad to adjust the value between -10 (dimkest) and +10 (brightest), then press Enter to confirm.</p> <p><b>Contrast:</b> Sets the light-dark contrast of the video feed. Use the arrow keys, rotary knob, or data keypad to adjust the value between 0 and 20, then press Enter to confirm.</p> <p><b>Sharpness:</b> Sets the sharpness of the video feed. Use the arrow keys, rotary knob, or data keypad to adjust the value between 0 (softest) and 10 (sharpest), then press Enter to confirm.</p>
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## 4-6 Cable Analyzer Shortcut Data Keypad Menu

The following information details the shortcut data keypad buttons and respective menus. The shortcut data keypad menus are used by pressing the numerical key corresponding to the desired command, when *not* in the process of entering a parameter.

### File (#1)

Pressing File opens the File Manager. Refer to Chapter 8 – File Management for detailed information on File Manager operation.

### Touch (#2)

Pressing Touch opens the Touchscreen menu, enabling you to recalibrate the instrument's touchscreen.

### Sweep (#3)

Pressing Sweep opens the Sweep menu in select measurement modes. Refer to subsections 4-1.7, 4-2.5, 4-3.3, and 4-4.3 for Sweep menu and submenu details in various measurement modes.

### ScrnShot (#4)

Pressing the 4 key takes a picture of the current measurement display and saves it to the device's internal storage.

### Trace (#5)

Pressing the 5 key opens the Trace submenu in select measurement modes. Refer to subsection 4-1.8 for Trace menu and submenu details.

### Limit (#6)

Pressing the 6 key opens the Limit submenu in select measurement modes. Refer to subsections 4-1.6, 4-2.6, 4-3.4, and 4-4.4 for Limit menu and submenu details in various measurement modes.

### Task Plan (#7)

Not active in current models.

### System (#8)

Pressing the 8 key opens the system menu. Refer to Chapter 9 – System Operations for details.

### Preset (#9)

Pressing the 9 key resets the instrument to its initial factory settings.

### Help (#0)

Pressing Help opens the Help screen, providing context-sensitive help for main menu functions. The Help screen displays instructions according to the measurement mode that is currently active.

### AutoScl (.)

Not active in current models.

### Run/Hold (+/-)

Pressing Run/Hold stops ("holds") the current trace upon completion. Pressing the button a second time resumes the trace function, placing the instrument into Free Run mode.



# Chapter 5 — Return Loss Measurement Testing

## Introduction

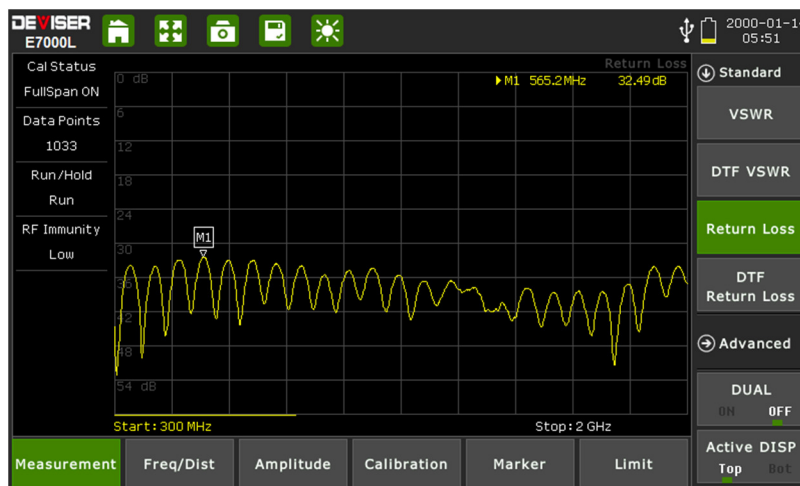
This chapter provides an overview of performing **Return Loss** measurements with the E7000L SitePROFILER Cable Analyzer. The Return Loss measurement is used to characterize the cable and antenna system in order to ensure that the cell site is performing in accordance with established standards.

Underperforming cell sites typically exhibit a high level of signal reflections, due to impedance mismatches within the cable and antenna system. Impedance mismatch issues often contribute to blocked or dropped calls, poor data rates, and an overall undesirable performance in cell (or section of cell) coverage. Thus, the Return Loss performance of the antenna system – included the cable feedline – is a critical factor in the service and maintenance of an RF transmitter system.

Return Loss and VSWR both display the match of the system, but they show it in different ways. The return loss displays the ratio of reflected power to reference power in decibels (dB). The return loss view is usually preferred because of the benefits of a logarithmic display; for one, it is easier to compare a small and large number on a logarithmic scale. The return loss scale is normally set up from 0 to 60 dB, with 0 being an open or a short and 60 dB being close to a perfect match.

Reflection measurements are generally performed with the antenna connected to the cable feedline, or by replacing the antenna with a Load at the end of the RF cable.

To begin a Return Loss measurement, press the **Menu** button to open the measurement mode desktop, then tap the **Cable & Antenna** mode icon. In the **Measurement** main menu, select Return Loss.



### Which reflection measurement should I use?

Your specification (test procedure) will ordinarily direct you to make either a Return Loss or VSWR measurement. Typically, **system sweeps** are performed in Return Loss mode, while **component sweeps** are performed in VSWR mode.

For your convenience, the E7000L SitePROFILER can perform Return Loss and VSWR sweeps simultaneously while in **Dual Display** mode.

**NOTE: The larger of the values of the Return Loss measurement, the better the impedance match. Thus a Return Loss measurement of 42dB represents a much better impedance match than one of 25dB. Conversely, in VSWR, better impedance matches are indicated by smaller values.**

## 5-1 Setting Up a Return Loss Measurement

The following is a step-by-step guide for preparing to conduct a return loss measurement using the E7000L SitePROFILER cable analyzer.

### Procedure:

1. To set the instrument in the cable analyzer mode, press the **Menu** button to view the measurement mode desktop. Tap the **Cable & Antenna** softkey.
2. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Under the **Standard** submenu, select **Return Loss**.
  - a. To determine which measurement is best for your needs, please refer to the Introduction of this chapter.
3. Tap the **Freq/Dist** main menu softkey. Under the **Frequency** submenu, set your desired Start and Stop frequencies. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Start Freq** and using the arrow keys, data keypad, or rotary knob. Press Enter to confirm. Repeat for **Stop Freq**.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink**, **Downlink**, or **Uplink + Downlink**.
4. If "ON" appears under Calibration Status on the left-hand side of the display, continue to step 5. Otherwise, you will need to calibrate the instrument. See Chapter 3 — Calibrating the E7000L.
5. Tap the **Amplitude** main menu key and use the **Top** and **Bottom** softkeys to set the amplitude scale. A general guideline for best measurement results is to set Top to 0dB and Bottom to 60dB, or simply tap **Full Scale**.
6. Press the **Sweep (#3)** datakey to open the Sweep submenu. Tap **Data Points** to select the resolution of your measurement. You may choose 130, 259, 517, 1033, or 2056 data points.
  - a. The default setting is 259. The higher the setting, the longer it will take to complete a sweep.
7. In the Sweep submenu, tap **RF Immunity** to toggle interference rejection between **High** and **Low** depending on your measurement needs.

## 5-2 Making a Return Loss Measurement

Once you have set the desired parameters (as covered in Section 5-1), the instrument is ready to perform the Return Loss measurement.

### Procedure:

1. Connect the antenna or cable feedline to the RF Out port on the instrument, using a test port extension cable if necessary.
2. The measurement trace will appear on the instrument display in real time.
3. For best results, allow the instrument to perform several sweeps in Continuous mode.

For details on analyzing the measurement results, please refer to Chapter 16 — Markers and Limit Lines.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Return loss measurements will save as .RTL files. For more details on naming and saving files to the instrument or USB, see Section 17-2.



# Chapter 6 — VSWR Measurement Testing

## Introduction

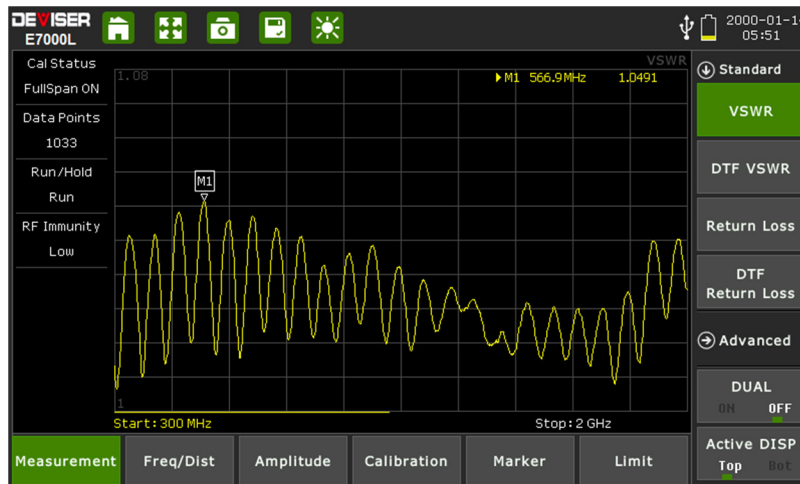
This chapter provides an overview of performing **Voltage Standing Wave Ratio** (VSWR) measurements with the E7000L SitePROFILER Cable Analyzer. Like Return Loss, VSWR is used to characterize the cable and antenna system in order to ensure that the cell site is performing in accordance with established standards.

In telecommunications, the Standing Wave Ratio (SWR) is the ratio of a partial standing wave's maximum amplitude to its minimum amplitude in an electrical transmission line. The SWR is usually defined as a Voltage ratio called the VSWR. For example, the VSWR value 1.2:1 denotes the maximum standing wave amplitude that is 1.2 times greater than the minimum standing wave value.

VSWR displays the match of the system linearly, rather than logarithmically. VSWR measures the ratio of voltage peaks and valleys. If the match is not perfect, the peaks and valleys of the returned signal will not align perfectly with the transmitted signal. The greater this number, the worse the match. A perfect or ideal match in VSWR terms would be 1:1; however, a more realistic match for a cable & antenna system would be something like 1.43 (15 dB). Antenna manufacturers typically specify the match in VSWR. The scale of a VSWR is usually defaulted to setup between 1 and 65.

Reflection measurements are generally performed with the antenna connected to the cable feedline, or by replacing the antenna with a Load at the end of the RF cable.

To begin a VSWR measurement, press the **Menu** button to open the measurement mode desktop, then tap the **Cable & Antenna** mode icon. In the **Measurement** main menu, select VSWR.



### Which reflection measurement should I use?

Your specification (test procedure) will ordinarily direct you to make either a Return Loss or VSWR measurement. Typically, **system sweeps** are performed in Return Loss mode, while **component sweeps** are performed in VSWR mode.

For your convenience, the E7000L SitePROFILER can perform Return Loss and VSWR sweeps simultaneously while in **Dual Display** mode.

**NOTE: The larger of the values of the Return Loss measurement, the better the impedance match. Thus a Return Loss measurement of 42dB represents a much better impedance match than one of 25dB. Conversely, in VSWR, better impedance matches are indicated by smaller values.**

## 6-1 Setting Up a VSWR Measurement

The following is a step-by-step guide for preparing to conduct a VSWR measurement using the E7000L SitePROFILER cable analyzer.

### Procedure:

1. To set the instrument in the cable analyzer mode, press the **Menu** button to view the measurement mode desktop. Tap the **Cable & Antenna** softkey.
2. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Under the **Standard** submenu, select **VSWR**.
  - a. To determine which measurement is best for your needs, please refer to the Introduction of this chapter.
3. Tap the **Freq/Dist** main menu softkey. Under the **Frequency** submenu, set your desired Start and Stop frequencies. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Start Freq** and using the arrow keys, data keypad, or rotary knob. Press Enter to confirm. Repeat for **Stop Freq**.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink**, **Downlink**, or **Uplink + Downlink**.
4. If "ON" appears under Calibration Status on the left-hand side of the display, continue to step 5. Otherwise, you will need to calibrate the instrument. See Chapter 3 — Calibrating the E7000L.
5. Tap the **Amplitude** main menu key and use the **Top** and **Bottom** softkeys to set the amplitude scale. A general guideline for best measurement results is to set Top to 60dB and Bottom to 1dB, or simply tap **Full Scale** or **Auto Scale**.
6. Press the **Sweep (#3)** datakey to open the Sweep submenu. Tap **Data Points** to select the resolution of your measurement. You may choose 130, 259, 517, 1033, or 2056 data points.
  - a. The default setting is 259. The higher the setting, the longer it will take to complete a sweep.
7. In the Sweep submenu, tap **RF Immunity** to toggle interference rejection between **High** and **Low** depending on your measurement needs.

## 6-2 Making a VSWR Measurement

Once you have set the desired parameters (as covered in Section 6-1), the instrument is ready to perform the VSWR measurement.

### Procedure:

1. Connect the antenna or cable feedline to the RF Out port on the instrument, using a test port extension cable if necessary.
2. The measurement trace will appear on the instrument display in real time.
3. For best results, allow the instrument to perform several sweeps in Continuous mode.

For details on analyzing the measurement results, please refer to Chapter 16 — Markers and Limit Lines.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. VSWR measurements will save as .SWR files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

# Chapter 7 — DTF Measurement Testing

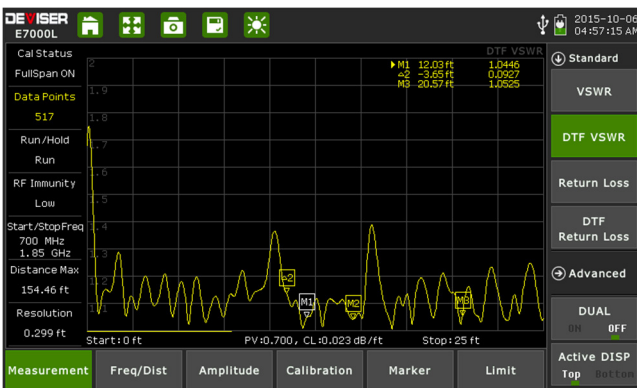
## Introduction

This chapter provides an overview of performing **Distance-to-Fault (DTF)** measurements with E7000L SitePROFILER. While reflection measurements express a cell site's RF transmission efficiency, DTF measurements actually identify the location of a specific fault (impedance mismatch) within the cable and antenna system.

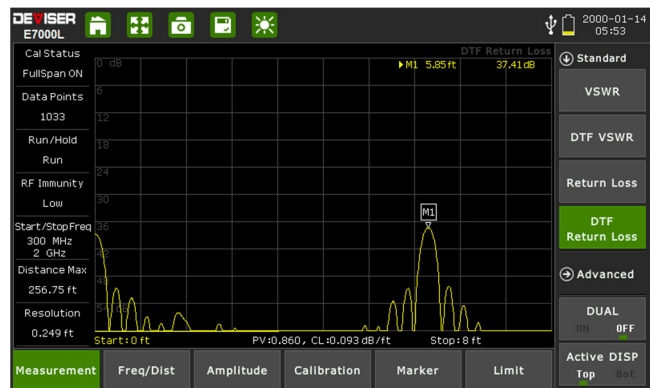
Since reflection measurements verify the impedance discontinuity of the total feedline system, it is crucial to perform DTF measurements to identify the exact component degrading the line system's performance. Here, the instrument transmits a test signal along the conductor or transmission medium. If the conductor is of uniform impedance and properly terminated, the entire transmitted signal will be absorbed in the far-end termination and no signal will be reflected toward the instrument. Any impedance discontinuities will cause some of the incident signal to be sent back towards the source.

Higher impedance creates a reflection that reinforces the original signal, while lower impedance creates a reflection that opposes the original signal. The resulting reflected signal is plotted as a function of time. In addition, because the speed of signal propagation is relatively constant for a given transmission medium, it can also be read as a function of cable length. The SitePROFILER can verify cable impedance characteristics, splice and connector locations and associated losses, and estimate cable lengths or faulty location.

To begin a Distance-to-Fault measurement, press the **Menu** button to open the measurement mode desktop, then tap the **Cable & Antenna** mode icon. Tap the Measurement main menu key along the bottom of the display, then open the Standard submenu and choose a DTF measurement.



DTF-VSWR



DTF Return Loss

### Which DTF measurement should I use?

Your specification (test procedure) will ordinarily direct you to make either a DTF Return Loss or DTF VSWR measurement. Typically, **site sweeps** are performed in DTF Return Loss mode. This is because it is easier to spot subtle differences and compare large and small values in the DTF Return Loss logarithmic display.

For your convenience, the E7000L SitePROFILER can perform DTF Return Loss and DTF VSWR sweeps simultaneously while in **Dual Display** mode.

**NOTE: The larger the values of the DTF Return Loss measurement, the better the impedance match. Thus a Return Loss measurement of 42dB represents a much better impedance match than one of 25dB. Conversely, in DTF VSWR, better impedance matches are indicated by smaller values.**

## 7-1 Setting Up a DTF Measurement

The following is a step-by-step guide for preparing to conduct a distance-to-fault measurement using the E7000L SitePROFILER cable analyzer.

### Procedure:

1. To set the instrument in the cable analyzer mode, press the **Menu** button to view the measurement mode desktop. Tap the **Cable & Antenna** softkey.
2. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Under the **Standard** submenu, select either **DTF Return Loss** or **DTF VSWR**.
  - a. To determine the best measurement for your needs, see the Introduction of this chapter.
3. Tap the **Freq/Dist** main menu softkey. Under the **Frequency** submenu, set your desired Start and Stop frequencies. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Start Freq** and using the arrow keys, data keypad, or rotary knob. Press Enter to confirm. Repeat for **Stop Freq**.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink**, **Downlink**, or **Uplink + Downlink**.
4. For a DTF measurement, you must now specify the length of the transmission line ("distance") and the type of cable in use. The cable type determines the propagation velocity and cable loss.

**NOTE: Selecting the correct cable is vital for achieving accurate measurements and locating faults. Specifying an incorrect cable type, or setting a measurement frequency out of the cable's range, will affect the DTF trace.**

5. Still under Freq/Dist, open the **Distance** submenu. Enter the start and stop distance; be sure that you toggle **Dist Units** to highlight the correct unit.
6. Still under Freq/Dist, open the **DTF Setup** submenu and tap **Cable**. Double-tap your preferred cable on the list to select it and return to the DTF Setup submenu.
  - a. If you are sweeping the entire feedline (jumpers plus main feeder), use the main feedline as the cable type for your measurement.
7. If "ON" appears under Calibration Status on the left-hand side of the display, continue to step 8. Otherwise, you will need to calibrate the instrument. See Chapter 3 — Calibrating the E7000L.
8. Tap the **Amplitude** main menu key and use the **Top** and **Bottom** softkeys to set the amplitude scale. The ideal amplitude scale will differ depending on which reflection measurement you selected in step 2. Some general guidelines for best measurements results are:
  - a. For DTF Return Loss, set Top to 0dB and Bottom to 60dB, or simply tap **Full Scale**.
  - b. For DTF VSWR, set Top to 60dB and Bottom to 1dB, or simply tap **Full Scale** or **Auto Scale**.
9. Press the **Sweep (#3)** datakey to open the Sweep submenu. Tap **Data Points** to select the resolution of your measurement. You may choose 130, 259, 517, 1033, or 2056 data points.
  - a. The default setting is 517. The higher the setting, the longer it will take to complete a sweep.
10. In the Sweep submenu, tap **RF Immunity** to toggle interference rejection between **High** and **Low** depending on your measurement needs.
  - a. The default setting is Low. Use High when you suspect a high level of RF signal energy from neighboring cell sites, or other potential interference in the area.

## 7-2 Making a DTF Measurement

Once you have selected a measurement type and set the desired parameters (as covered in Section 7-1), the instrument is ready to perform the DTF measurement.

### Procedure:

1. Connect the antenna or cable feedline to the RF Out port on the instrument, using a test port extension cable if necessary.
2. The measurement trace will appear on the instrument display in real time.
3. You may wish to select **Single Sweep**, to hold measurement data for easier analysis and saving.

For details on analyzing the measurement results, please refer to Chapter 16 — Markers and Limit Lines.

### Saving the Measurement:

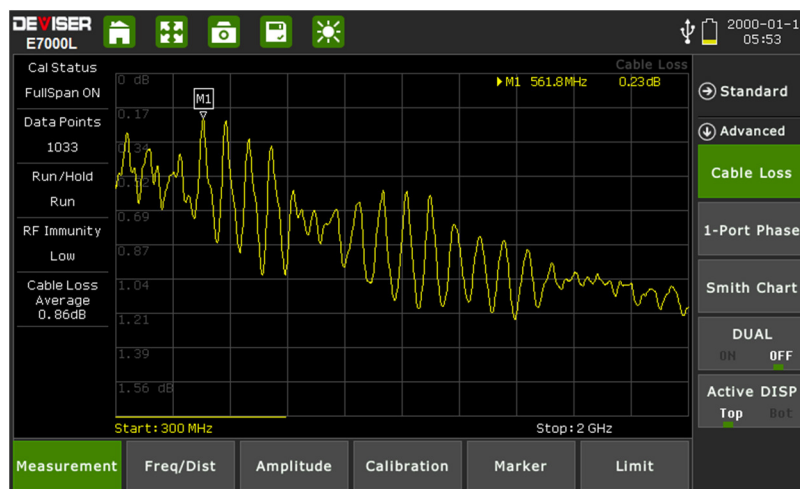
When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. DTF return loss measurements will save as .DRL files, while DTF-VSWR measurements will save as .DVS files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

## Chapter 8 — One Port Cable Loss Measurement Testing

### Introduction

This chapter provides an overview of performing **Cable Loss** measurements with the E7000L SitePROFILER Cable Analyzer. The **One Port Cable Loss** measurement checks the signal attenuation level (insertion loss) of the RF cable. Excessive cable loss will negatively affect cell site coverage.

This measurement can be especially useful in measuring the loss of feed line connected to the antenna. By placing a short at the end of the cable or leaving it open, the signal is reflected back and the energy lost in the cable can be computed. Cables with larger diameter generally have less insertion loss and better power handling capabilities than cables with smaller diameter.



### 8-1 Setting Up a One Port Cable Loss Measurement

The following is a step-by-step guide for preparing to conduct a cable loss measurement using the E7000L SitePROFILER cable analyzer.

#### Procedure:

1. To set the instrument in the cable analyzer mode, press the **Menu** button to view the measurement mode desktop. Tap the **Cable & Antenna** softkey.
2. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Under the **Advanced** submenu, select **Cable Loss**.
3. Tap the **Freq/Dist** main menu softkey. Under the **Frequency** submenu, set your desired Start and Stop frequencies. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Start Freq** and using the arrow keys, data keypad, or rotary knob. Press Enter to confirm. Repeat for **Stop Freq**.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink**, **Downlink**, or **Uplink + Downlink**.
4. Still under Freq/Dist, open the **Distance** submenu. Enter the start and stop distance; be sure that you toggle **Dist Units** to highlight the correct unit.

5. Still under Freq/Dist, open the **DTF Setup** submenu and tap **Cable**. Double-tap your preferred cable on the list to select it and return to the DTF Setup submenu.
  - a. If you are sweeping the entire feedline (jumpers plus main feeder), use the main feedline as the cable type for your measurement.
6. If "ON" appears under Calibration Status on the left-hand side of the display, continue to step 7. Otherwise, you will need to calibrate the instrument. See Chapter 3 — Calibrating the E7000L.
7. Tap the **Amplitude** main menu key, then tap **Auto Scale**. Use the **Top** and **Bottom** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range.
8. Press the **Sweep (#3)** datakey to open the Sweep submenu. Tap Data Points to select the resolution of your measurement. You may choose 130, 259, 517, 1033, or 2056 data points.
  - b. The default setting is 259. The higher the setting, the longer it will take to complete a sweep.
9. In the Sweep submenu, tap **RF Immunity** to toggle interference rejection between **High** and **Low** depending on your measurement needs.
  - a. The default setting is Low. Use High when you suspect a high level of RF signal energy from neighboring cell sites, or other potential interference in the area.

## 8-2 Making a One Port Cable Loss Measurement

Once you have selected a measurement type and set the desired parameters (as covered in Section 8-1), the instrument is ready to perform the Cable Loss measurement.

### Procedure:

1. Connect the antenna or cable feedline to the RF Out port on the instrument, using a test port extension cable if necessary.
2. The measurement trace will appear on the instrument display in real time.
3. For best results, allow the instrument to perform several sweeps in Continuous mode.

For details on analyzing the measurement results, please refer to Chapter 16 — Markers and Limit Lines.

### Saving the Measurement:

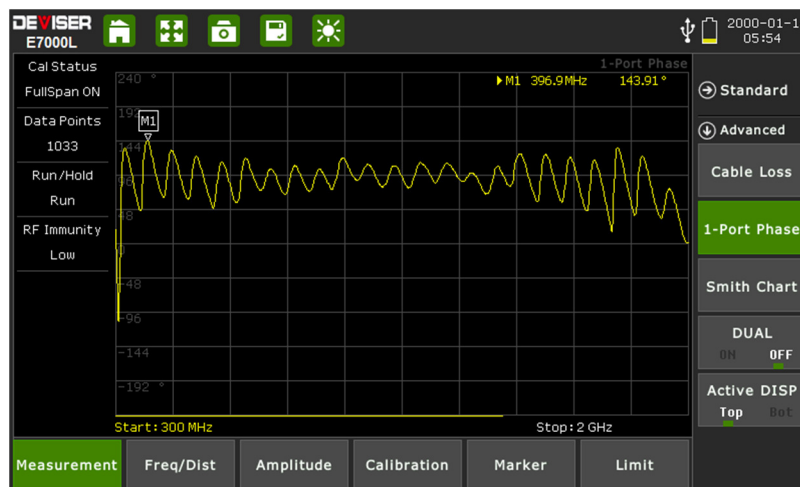
When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Cable loss measurements will save as .CBL files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

## Chapter 9 — One Port Phase Measurement Testing

### Introduction

This chapter provides an overview of performing **One-Port Phase** measurements with the E7000L SitePROFILER Cable Analyzer. The **One-Port Phase** application measures S11 phase of a reflection measurement, which is commonly used to tune antennas and phase match cables. It is also favored when one end of the cable cannot be brought up to the test instrument – or in cases where “measure-and-snip” operations must be performed to create cables of exactly the right phase length for a prescribed frequency.

The one-port phase measurement is most useful when making relative measurements (comparing the phase of one device to the phase of another) by utilizing the Data Math function. See subsection 4-1.8 for more details on Data Math in the **Trace** menu.)



### 9-1 Setting Up a One Port Phase Measurement

The following is a step-by-step guide for preparing to conduct a one-port phase measurement using the E7000L SitePROFILER cable analyzer.

#### Procedure:

1. To set the instrument in the cable analyzer mode, press the **Menu** button to view the measurement mode desktop. Tap the **Cable & Antenna** softkey.
2. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Under the **Advanced** submenu, select **1-Port Phase**.
3. Tap the **Freq/Dist** main menu softkey. Under the **Frequency** submenu, set your desired Start and Stop frequencies to cover the normal operating range of the antenna or cable to be measured, plus a suitable margin. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Start Freq** and using the arrow keys, data keypad, or rotary knob. Press Enter to confirm. Repeat for **Stop Freq**.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink**, **Downlink**, or **Uplink + Downlink**.
4. Still under Freq/Dist, open the **Distance** submenu. Enter the start and stop distance; be sure that you toggle **Dist Units** to highlight the correct unit.



5. Still under Freq/Dist, open the **DTF Setup** submenu and tap **Cable**. Double-tap your preferred cable on the list to select it and return to the DTF Setup submenu.
  - a. If you are sweeping the entire feedline (jumpers plus main feeder), use the main feedline as the cable type for your measurement.
6. If "ON" appears under Calibration Status on the left-hand side of the display, continue to step 6. Otherwise, you will need to calibrate the instrument. See Chapter 3 — Calibrating the E7000L.
7. Tap the **Amplitude** main menu key. Use the **Top** and **Bottom** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range.
  - a. The default range is generally -180° to +180°. Auto-adjust it with **Auto Scale** or **Full Scale**.
8. Press the **Sweep (#3)** datakey to open the Sweep submenu. Tap Data Points to select the resolution of your measurement. You may choose 130, 259, 517, 1033, or 2056 data points.
  - c. The default setting is 517. The higher the setting, the longer it will take to complete a sweep.
9. In the Sweep submenu, tap **RF Immunity** to toggle interference rejection between **High** and **Low** depending on your measurement needs.
  - a. The default setting is Low. Use High when you suspect a high level of RF signal energy from neighboring cell sites, or other potential interference in the area.

## 9-2 Making a One Port Phase Measurement

Once you have selected a measurement type and set the desired parameters (as covered in Section 9-1), the instrument is ready to perform the One-Port Phase measurement.

### Procedure:

1. Connect the antenna or cable feedline to the RF Out port on the instrument, using a test port extension cable if necessary.
2. The measurement trace will appear on the instrument display in real time.
3. For best results, allow the instrument to perform several sweeps in Continuous mode.

For details on analyzing the measurement results, please refer to Chapter 16 — Markers and Limit Lines.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Phase measurements will save as .PHA files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

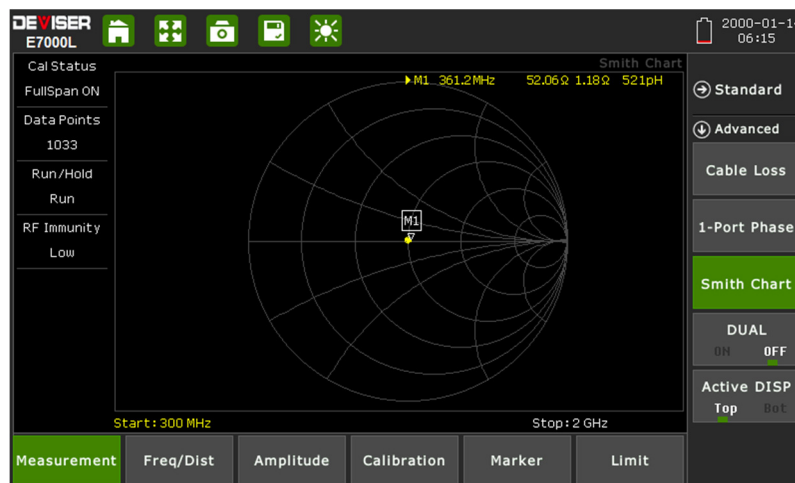
## Chapter 10 — Smith Chart Measurement Testing

### Introduction

This chapter provides an overview of performing **Smith Chart** measurements with the E7000L SitePROFILER Cable Analyzer. The Smith Chart is a graphical tool that is used to plot the impedance of the device connected to the RF Out port of the SitePROFILER. This application converts the measured reflection coefficient data into impedance data, and displays it in a way useful 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. It can also be used to measure the impedance characteristics on filter and duplexer devices, or even to verify the condition of an OSL calibration device that may be damaged.

**NOTE: Limit lines and delta markers cannot be set in a Smith Chart measurement.**



### 10-1 Setting Up a Smith Chart Measurement

The following is a step-by-step guide for preparing to conduct a Smith Chart measurement using the E7000L SitePROFILER cable analyzer.

#### Procedure:

1. To set the instrument in the cable analyzer mode, press the **Menu** button to view the measurement mode desktop. Tap the **Cable & Antenna** softkey.
2. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Under the **Advanced** submenu, select **Smith Chart**.
3. Tap the **Freq/Dist** main menu softkey. Under the **Frequency** submenu, set your desired Start and Stop frequencies to cover the normal operating range of the antenna or cable to be measured, plus a suitable margin. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Start Freq** and using the arrow keys, data keypad, or rotary knob. Press Enter to confirm. Repeat for **Stop Freq**.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink**, **Downlink**, or **Uplink + Downlink**.

4. If "ON" appears under Calibration Status on the left-hand side of the display, continue to step 6. Otherwise, you will need to calibrate the instrument. See Chapter 3 — Calibrating the E7000L.
5. Tap the **Amplitude** main menu key. Use the **Scale/DIV** softkey to set the scale per division, or tap **Full Scale** to default to 1 U.
6. Press the **Sweep (#3)** datakey to open the Sweep submenu. Tap Data Points to select the resolution of your measurement. You may choose 130, 259, 517, 1033, or 2056 data points.
  - d. The default setting is 517. The higher the setting, the longer it will take to complete a sweep.
7. In the Sweep submenu, tap **RF Immunity** to toggle interference rejection between **High** and **Low** depending on your measurement needs.
  - a. The default setting is Low. Use High when you suspect a high level of RF signal energy from neighboring cell sites, or other potential interference in the area.

## 10-2 Making a Smith Chart Measurement

Once you have selected a measurement type and set the desired parameters (as covered in Section 10-1), the instrument is ready to perform the Smith Chart measurement.

### Procedure:

4. Connect the antenna or cable feedline to the RF Out port on the instrument, using a test port extension cable if necessary.
5. The measurement trace will appear on the instrument display in real time.
6. For best results, allow the instrument to perform several sweeps in Continuous mode.

For details on analyzing the measurement results, please refer to Chapter 16 — Markers and Limit Lines.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Smith Chart measurements will save as .SMI files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

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### 10-2.1 — Regarding Smith Chart Limit Lines

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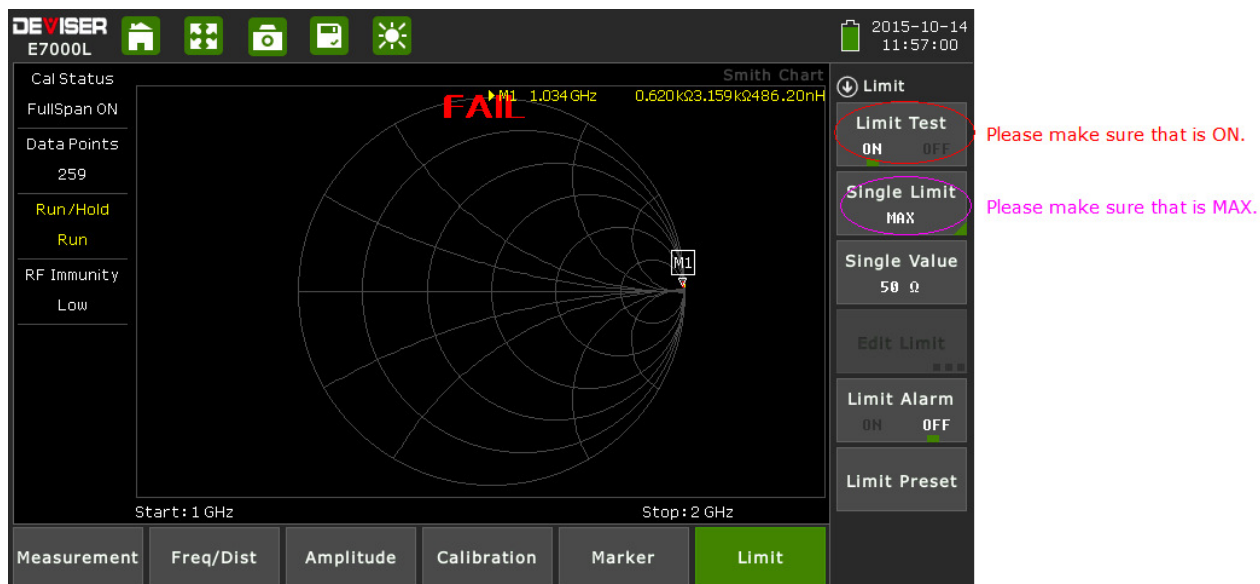
As in other measurement modes, the user may conduct pass/fail analyses in the Smith Chart application by setting upper and lower limit lines from the **Limit (#6)** main menu. If the measurement exceeds the specified limit range, the instrument will display a **FAIL** indicator (and emit an audio signal, if Limit Alarm is on).

However, limit lines function and appear somewhat differently on a Smith Chart. This subsection will provide step-by-step examples of two ways to set limits in the Smith Chart application.

*For a general explanation of using limits with the E7000L SitePROFILER, please see Section 16-2.*

#### Setting a Single Upper Limit Line

1. First, in the Limit menu, toggle Limit Test to **ON**.
2. Tap the **Single Limit** softkey to open a submenu. Here, select **MAX** to set an upper limit.
3. Tap **Single Value** to set the value of the upper limit. A measurement below this value will PASS; one above this value will FAIL. Use the arrow keys, rotary knob, or data keypad to enter 50  $\Omega$ , then press Enter to confirm.
4. On the measurement display, passing regions of the measurement will appear in yellow and failing regions will appear in red.

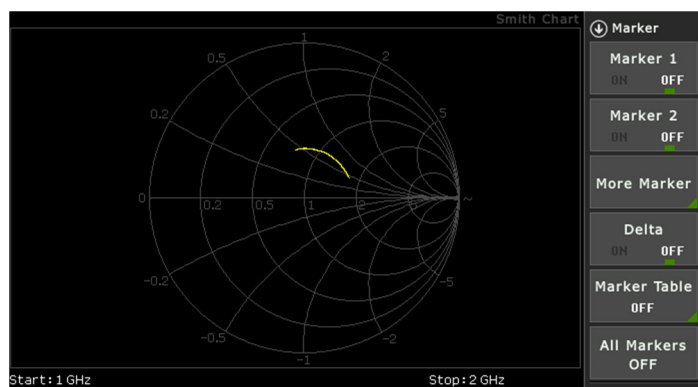


### Setting a Multi-Segmented Limit Line

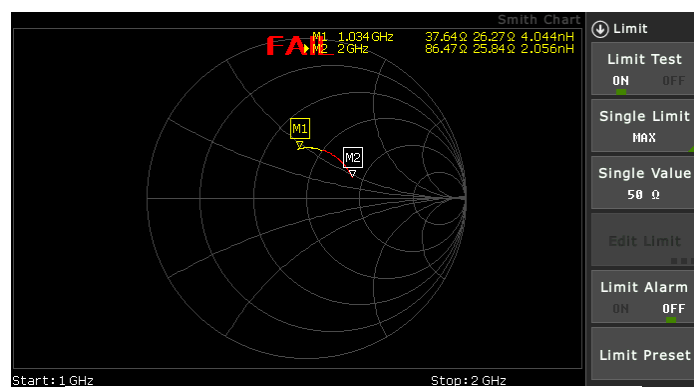
1. In the Limit menu, tap **Single Limit** and select **OFF**.
2. Tap **Edit Limit**. The display will shrink to preview the current measurement and display a limit table.
3. Tap **Add** to add a new limit line to the table. From left to right, you can tap each field to adjust it using the arrow keys, rotary knob, or data keypad. Tap a field once to outline it, and again to edit (or press the Enter button).
4. Create two limit lines according to the table below. (The table displayed on the instrument should match the one provided here.)

#	Type	Begin Frequency	End Frequency	Begin Amplitude	End Amplitude
1	MAX	2 MHz	4.4 GHz	80Ω	80Ω
2	MIN	2 MHz	4.4 GHz	20Ω	20Ω

5. The measurement preview will change to reflect the new passing limit range: 20 - 80Ω. Any region of the measurement trace within this range will appear in yellow. If this reflects the entire trace, the word **PASS** will appear in green.



Smith Chart trace with no limit lines set...



... and now with a single upper limit of 50 Ω.  
Note the bifurcated line, indicating that only part of the measurement exceeds the limit.

## Optional Measurement Modes

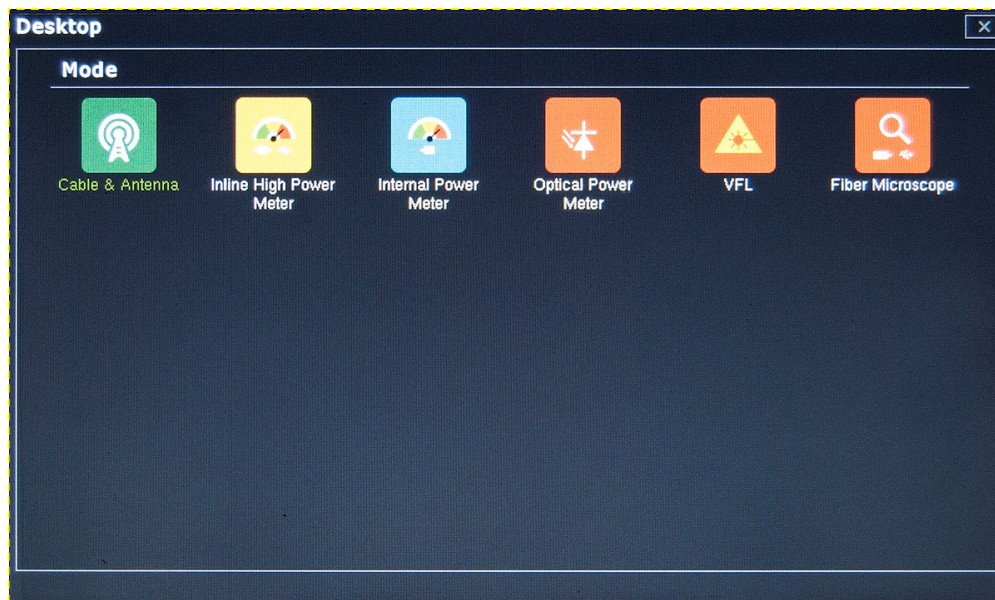
Aside from Cable & Antenna, additional measurement modes can be added to the E7000L SitePROFILER's functionality either at the time of purchase or at a later date, as your test needs evolve.

The following chapters provide an overview of these optional measurement modes:

- Inline High Power Meter (Chapter 11)
- Internal Power Meter (Chapter 12)
- Optical Power Meter (Chapter 13)
- Visual Fault Locator (VFL) (Chapter 14)
- Fiber Inspection (Chapter 15)

You can access software-enabled measurement options by pressing the **Menu** button to the top-right of the display, then selecting from the measurement mode icons.

**For a full list of available measurement options, please see Section 1-3 of this User Guide.**



## Chapter 11 — Inline High Power Meter

### Introduction

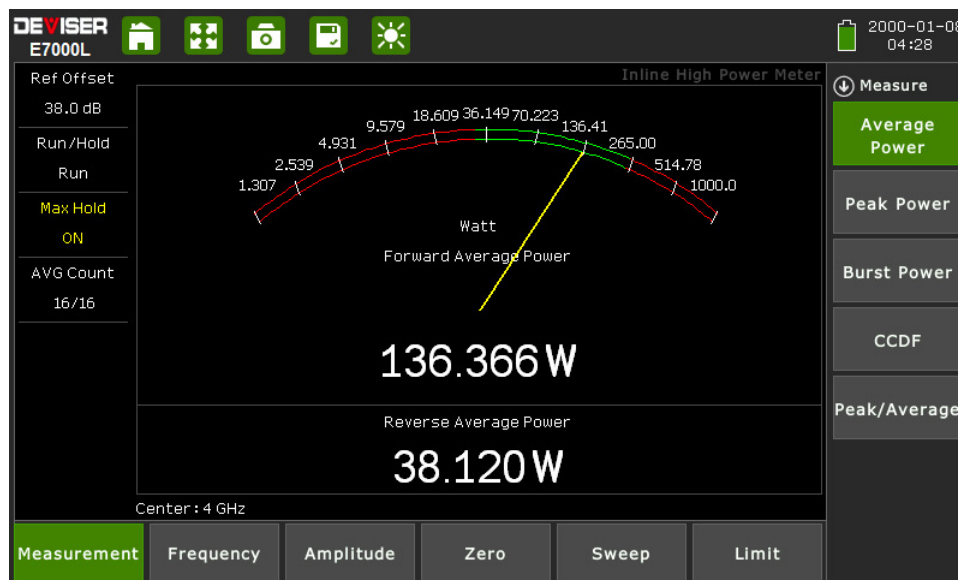
The **Inline High Power Meter** measurement mode is intended to mimic a traditional thermal (thermo-electric) power sensor. Therefore, it is ideal for measuring the average power of CW or modulated RF waveforms such as 3G, 4G, OFDM, and multi-tone signals. In other words, it measures true RMS power regardless of the type of input signal.

**NOTE: Effective use of the Inline High Power Meter mode requires the external power sensor accessory (PN: E7000-00500). All instructions in this chapter assume that the power sensor's USB and RF In ports are connected to the instrument via the USB and RF Out ports on the instrument's top panel.**

There are five different measurements within the Inline High Power Meter mode. Refer to the associated section (in parentheses) for details on performing each measurement.

- Average Power, Forward & Reverse (Section 11-1)
- Peak Power (Section 11-2)
- Burst Power & Duty Cycle (Section 11-3)
- Complementary Cumulative Distribution Function (CCDF) (Section 11-4)
- Peak-to-Average (Section 11-5)

Enter this measurement mode by pressing the **Menu** button to the top-right of the display, then selecting the Inline High Power Meter icon.



#### Tips for Power Sensor Use:

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. To zero the sensor, open the **Zero** main menu key and tap the **Zero** softkey. (This is not the same as the number "0" on the data keypad.)

The signal channel/analog signal acquisition hardware is integrated along with the RF front end of the power sensor. All of the necessary frequency and temperature corrections take place within the sensor. Therefore, there is no need for a reference calibration with the sensor.

## 11-1 Making an Average Power Measurement

The following is a step-by-step guide for conducting an Average Power measurement in Inline High Power Meter mode. Average power describes the mean power delivered over several cycles. The analog power meter display will depict the forward power reading, or what is being transmitted; the reverse average power depicts the reflected power reading. A high reverse power reading could indicate impedance mismatch issues. Check the channel and transmitter settings.

### Procedure:

1. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Select **Average Power**.
2. Tap the **Frequency** main menu softkey. Under the **Frequency** submenu, set your desired center frequency. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Center Freq** and using the arrow keys, data keypad, or rotary knob to adjust. Press Enter to confirm.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink** or **Downlink**. Set a specific channel of interest to test, or enter a **Ch Step** of 1 to test all available channels.
3. Tap the **Amplitude** main menu key. Use the **Max** and **Min** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range to display on the on-screen power meter.. You can also tap **Auto Scale** to set the max and min values to where the current measurement is easily visible, or **Full Scale** to display the entire measurement range.
  - a. Adjust **Ref Offset**, if necessary, to compensate for external input attenuation or gain.
  - b. Remember to select the appropriate measurement units.
4. Tap the **Sweep** main menu key and open the Sweep submenu. Set Sweep Type to **Cont** for continuous measurement, or **Sngl** for a single sweep.
5. Still in the Sweep main menu, open the **Average** submenu. Toggle Averaging **On** to activate the per-sweep averaging function, where the measurement displays the mean data of numerous sweeps (as determined by the **AVG Factor**). Use to obtain stable readings from an erratic signal.
6. If the instrument is properly connected and configured, the yellow needle on the display will swing to indicate the forward average power reading. The reverse average power will appear in a small numerical pane below.
7. You can toggle **Max Hold** to the left of the display (or in the Sweep menu) to freeze the reading at its highest measured level.
8. The red and green regions on the meter display indicate limit lines. Tap the **Limit** main menu key to adjust your upper and lower limits for pass/fail testing. Enable **Limit Alarm** for an audio failure cue.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Power meter measurements will save as .PMM files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

## 11-2 Making a Peak Power Measurement

The following is a step-by-step guide for conducting a Peak Power measurement in Inline High Power Meter mode.

### Procedure:

1. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Select **Peak Power**.
2. Tap the **Frequency** main menu softkey. Under the **Frequency** submenu, set your desired center frequency. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Center Freq** and using the arrow keys, data keypad, or rotary knob to adjust. Press Enter to confirm.
  - a. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink** or **Downlink**. . Set a specific channel of interest to test, or enter a **Ch Step** of 1 to test all available channels.
3. Tap the **Amplitude** main menu key. Use the **Max** and **Min** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range to display on the on-screen power meter. You can also tap **Auto Scale** to set the max and min values to where the current measurement is easily visible, or **Full Scale** to display the entire measurement range.
  - a. Adjust **Ref Offset**, if necessary, to compensate for external input attenuation or gain.
  - b. Remember to select the appropriate measurement units.
4. Tap the **Sweep** main menu key. Set Sweep Type to **Cont** for continuous measurement, or **Sngl** for a single sweep.
5. Still in the Sweep main menu, open the **Average** submenu. Toggle Averaging **On** to activate the per-sweep averaging function, where the measurement displays the mean data of numerous sweeps (as determined by the **AVG Factor**). Use to obtain stable readings from an erratic signal.
6. If the instrument is properly connected and configured, the yellow needle on the display will swing to indicate the forward peak power reading.
7. You can toggle **Max Hold** to the left of the display (or in the Sweep menu) to freeze the reading at its highest measured level.
8. The red and green regions on the meter display indicate limit lines. Tap the **Limit** main menu key to adjust your upper and lower limits for pass/fail testing. Enable **Limit Alarm** for an audio failure cue.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Power meter measurements will save as .PMM files. For more details on naming and saving files to the instrument or USB, see Section 17-2.



## 11-3 Making a Burst Power Measurement

The following is a step-by-step guide for conducting a Burst Power measurement in Inline High Power Meter mode. This application measures time-gated (non-CW) signal bursts, while the duty cycle describes the percentage of time in a given period during which the signal is on.

### Procedure:

1. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Select **Burst Power**.
2. Tap the **Frequency** main menu softkey. Under the **Frequency** submenu, set your desired center frequency. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Center Freq** and using the arrow keys, data keypad, or rotary knob to adjust. Press Enter to confirm.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink** or **Downlink**. Set a specific channel of interest to test, or enter a **Ch Step** of 1 to test all available channels.
3. Tap the **Amplitude** main menu key. Use the **Max** and **Min** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range to display on the on-screen power meter. You can also tap **Auto Scale** to set the max and min values to where the current measurement is easily visible, or **Full Scale** to display the entire measurement range.
  - a. Adjust **Ref Offset**, if necessary, to compensate for external input attenuation or gain.
  - b. Remember to select the appropriate measurement units.
4. Tap the **Sweep** main menu key. Set Sweep Type to **Cont** for continuous measurement, or **Sngl** for a single sweep.
5. Still in the Sweep main menu, open the **Average** submenu. Toggle Averaging **On** to activate the per-sweep averaging function, where the measurement displays the mean data of numerous sweeps (as determined by the **AVG Factor**). Use to obtain stable readings from an erratic signal.
6. If the instrument is properly connected and configured, the yellow needle on the display will swing to indicate the burst power reading. The duty cycle percentage will appear in a small numerical pane below.
7. You can toggle **Max Hold** to the left of the display (or in the Sweep menu) to freeze the reading at its highest measured level.
8. The red and green regions on the meter display indicate limit lines. Tap the **Limit** main menu key to adjust your upper and lower limits for pass/fail testing. Enable **Limit Alarm** for an audio failure cue.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Power meter measurements will save as .PMM files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

## 11-4 Making a CCDF Measurement

The following is a step-by-step guide for conducting a Complementary Cumulative Distribution Function (CCDF) measurement in Inline High Power Meter mode. The CCDF measurement provides the percentage of time the signal spends at or above a specific power level (with the power level expressed in units of dB, relative to the average power level).

### Procedure:

1. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Select **CCDF**.
2. Tap the **Frequency** main menu softkey. Under the **Frequency** submenu, set your desired center frequency. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Center Freq** and using the arrow keys, data keypad, or rotary knob to adjust. Press Enter to confirm.
  - c. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink** or **Downlink**. Set a specific channel of interest to test, or enter a **Ch Step** of 1 to test all available channels.
3. Tap the **Amplitude** main menu key. Use the **Max** and **Min** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range of interest. You can also tap **Auto Scale** to set the max and min values to where the current measurement is easily visible, or **Full Scale** to display the entire measurement range.
  - a. Adjust **Ref Offset**, if necessary, to compensate for external input attenuation or gain.
  - b. Remember to select the appropriate measurement units.
4. Tap the **Sweep** main menu key. Set Sweep Type to **Cont** for continuous measurement, or **Sngl** for a single sweep.
5. Still in the Sweep main menu, open the **Average** submenu. Toggle Averaging **On** to activate the per-sweep averaging function, where the measurement displays the mean data of numerous sweeps (as determined by the **AVG Factor**). Use to obtain stable readings from an erratic signal.
6. If the instrument is properly connected and configured, the CCDF reading will appear on the instrument display.
7. You can toggle **Max Hold** to the left of the display (or in the Sweep menu) to freeze the reading at its highest measured level.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Power meter measurements will save as .PMM files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

## 11-5 Making a Peak-to-Average Measurement

The following is a step-by-step guide for conducting a Peak/Average measurement in Inline High Power Meter mode. This displays the ratio of the peak measured power level to the time-averaged power level. This is also known as the PAR or crest factor.

### Procedure:

1. Tap the **Measurement** main menu softkey to open the Measurement menu on the right side of the display. Select **Peak/Average**.
2. Tap the **Frequency** main menu softkey. Under the **Frequency** submenu, set your desired center frequency. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Center Freq** and using the arrow keys, data keypad, or rotary knob to adjust. Press Enter to confirm.
  - c. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink** or **Downlink**. Set a specific channel of interest to test, or enter a **Ch Step** of 1 to test all available channels.
3. Tap the **Amplitude** main menu key. Use the **Max** and **Min** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range of interest. You can also tap **Auto Scale** to set the max and min values to where the current measurement is easily visible, or **Full Scale** to display the entire measurement range.
  - a. Adjust **Ref Offset**, if necessary, to compensate for external input attenuation or gain.
  - b. Remember to select the appropriate measurement units.
4. Tap the **Sweep** main menu key. Set Sweep Type to **Cont** for continuous measurement, or **Sngl** for a single sweep.
5. Still in the Sweep main menu, open the **Average** submenu. Toggle Averaging **On** to activate the per-sweep averaging function, where the measurement displays the mean data of numerous sweeps (as determined by the **AVG Factor**). Use to obtain stable readings from an erratic signal.
6. If the instrument is properly connected and configured, the peak-to-average reading will appear in real-time on the instrument display.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Power meter measurements will save as .PMM files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

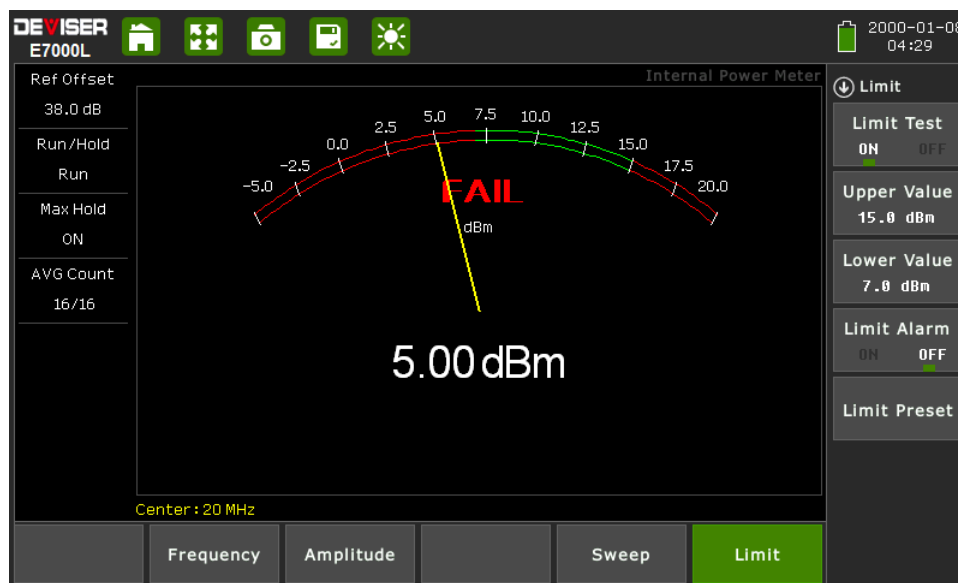
## Chapter 12 — Internal Power Meter

### Introduction

The **Internal Power Meter** measurement mode provides standard-accuracy RF power testing without the need for external equipment. Simply connect the source to be measured to the n(m) power meter connector on the instrument's top panel.

**NOTE: The power meter port is rated for connections up to, but not exceeding, +27 dBm /  $\pm$ 50V DC.**

Enter this measurement mode by pressing the **Menu** button to the top-right of the display, then selecting the Internal Power Meter icon.



## 12-1 Making an Internal Power Meter Measurement

The following is a step-by-step guide for conducting a power level measurement in the Internal Power Meter mode.

### Procedure

1. Tap the **Frequency** main menu softkey. Under the **Frequency** submenu, set your desired center frequency. There are two ways to accomplish this.
  - a. Manually enter the desired start frequency by tapping **Center Freq** and using the arrow keys, data keypad, or rotary knob to adjust. Press Enter to confirm.
  - b. Open the **Signal Standard** submenu and tap **Select Signal STD**. Double-tap your preferred signal standard on the list to select it and return to the submenu, then select the signal type by tapping **Uplink** or **Downlink**. Set a specific channel of interest to test, or enter a **Ch Step** of 1 to test all available channels.
2. Tap the **Amplitude** main menu key. Use the **Max** and **Min** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range of interest. You can also tap **Auto Scale** to set the max and min values to where the current measurement is easily visible, or **Full Scale** to display the entire measurement range.
  - a. Adjust **Ref Offset**, if necessary, to compensate for external input attenuation or gain.
  - b. Remember to select the appropriate measurement units.
3. Tap the **Sweep** main menu key. Set Sweep Type to **Cont** for continuous measurement, or **Sngl** for a single sweep.
4. Still in the Sweep main menu, open the **Average** submenu. Toggle Averaging **On** to activate the per-sweep averaging function, where the measurement displays the mean data of numerous sweeps (as determined by the **AVG Factor**). Use to obtain stable readings from an erratic signal.
5. If the instrument is properly connected and configured, the power reading will appear in real-time on the instrument display.
6. You can toggle **Max Hold** to the left of the display (or in the Sweep menu) to freeze the reading at its highest measured level.
7. The red and green regions on the meter display indicate limit lines. Tap the **Limit** main menu key to adjust your upper and lower limits for pass/fail testing. Enable **Limit Alarm** for an audio failure cue.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Power meter measurements will save as .PMM files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

## Chapter 13 — Optical Power Meter

### Introduction

The Optical Power Meter function of the E7000L SitePROFILER enables power measurements without carrying a separate power meter accessory or additional tools. This mode displays the power level on an analog meter in real time. Simply connect the fiber line to the OPM port on the instrument's top panel, between the RF Out and VFL ports. Configurable settings include display range, upper and lower limits, and power units (dBm or watts).

Enter this measurement mode by pressing the **Menu** button to the top-right of the display, then selecting the Optical Power Meter icon.



## 13-1 Making an Optical Power Meter Measurement

The following is a step-by-step guide for conducting a power level measurement in the Optical Power Meter mode.

### Procedure:

1. Tap the **Wavelength** main menu softkey. Select one of the listed wavelengths (in nm): 850, 980, 1300, 1310, 1490, 1550, 1610. Your selection will appear in the bottom-left-hand corner of the measurement display.
2. Tap the **Amplitude** main menu key. Use the **Max** and **Min** softkeys, along with the arrow keys, rotary knob, or data keypad, to adjust the amplitude range to display on the on-screen power meter. You can also tap **Auto Scale** to set the max and min values to where the current measurement is easily visible, or **Full Scale** to display the entire measurement range.
  - a. Adjust **Ref Offset**, if necessary, to compensate for external input attenuation or gain.
  - b. Remember to select the appropriate measurement units: **dBm** or **Watts**.
3. Tap the **Sweep** main menu key. Set Sweep Type to **Cont** for continuous measurement, or **Sngl** for a single sweep.
4. Still in the Sweep main menu, open the **Average** submenu. Toggle Averaging **On** to activate the per-sweep averaging function, where the measurement displays the mean data of numerous sweeps (as determined by the **AVG Factor**). Use to obtain stable readings from an erratic signal.
5. If the instrument is properly connected and configured, the yellow needle on the display will swing to indicate the power reading in real time.
6. You can toggle **Max Hold** to the left of the display (or in the Sweep menu) to freeze the reading at its highest measured level.
7. The red and green regions on the meter display indicate limit lines. Tap the **Limit** main menu key to adjust your upper and lower limits for pass/fail testing. Enable **Limit Alarm** for an audio failure cue.

### Saving the Measurement:

When you have conducted a successful measurement and wish to save the results for later viewing or analysis, press the **Save** button to the top-right of the display. Power meter measurements will save as .PMM files. For more details on naming and saving files to the instrument or USB, see Section 17-2.

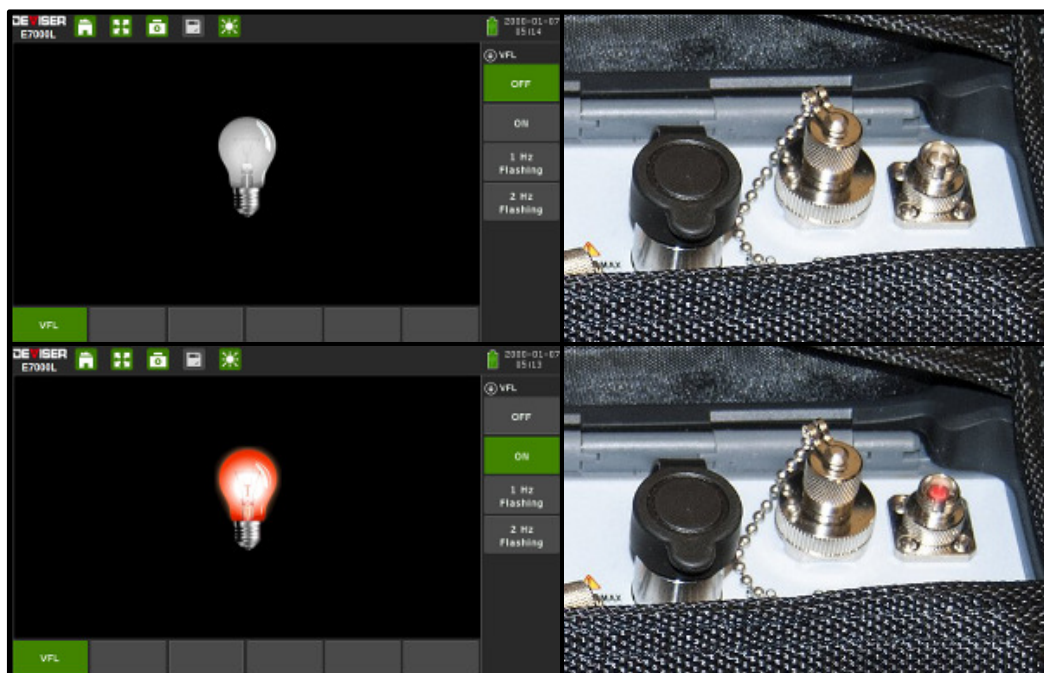
## Chapter 14 — Visual Fault Locator (VFL)

### Introduction

The E7000L SitePROFILER's **Visual Fault Locator** function enables visual confirmation of equipment faults without having to carry a separate piece of test equipment. This function provides a tightly-focused beam of red light, enabling you to check for damaged, broken, or spliced optical fibers and high-loss connectors (particularly important in short fiber lengths, where an OTDR cannot detect the fault). VFL can also trace the patch of fiber through multiple connections and identify the correct two fibers for loss testing.

**NOTE: The beam emitted by the VFL can cause vision damage. For your safety, do not look directly at the light beam for extended periods of time.**


Enter this mode by pressing the **Menu** button to the top-right of the display, then selecting the **VFL** icon.



### 14-1 Using the Visual Fault Locator

The following is a step-by-step guide to using the VFL option of the E7000L SitePROFILER cable analyzer.

#### Procedure:

1. On the SitePROFILER's top panel, locate the VFL emitter port marked with the following symbol .
2. Unscrew the chained metal cap covering the port and leave it aside. Be careful not to look directly into this port while using the instrument.
3. To set the instrument in the VFL mode, press the **Menu** button to view the measurement mode desktop. Tap the **VFL** softkey.
4. The VFL main menu will automatically appear to the right side of the display.
  - a. Tap **OFF** to disable the light. The displayed lightbulb icon will turn white.
  - b. Tap **ON** to activate the light, which will shine continuously. The lightbulb icon will turn red.
  - c. Tap **1 Hz Flashing** to automatically switch the light on and off at about 1 flash per second.
  - d. Tap **2 Hz Flashing** to automatically switch the light on and off at about 2 flashes per second.
5. Connect the fiber to the port. Visible light will leak through the sheath, highlighting cracks or bends.



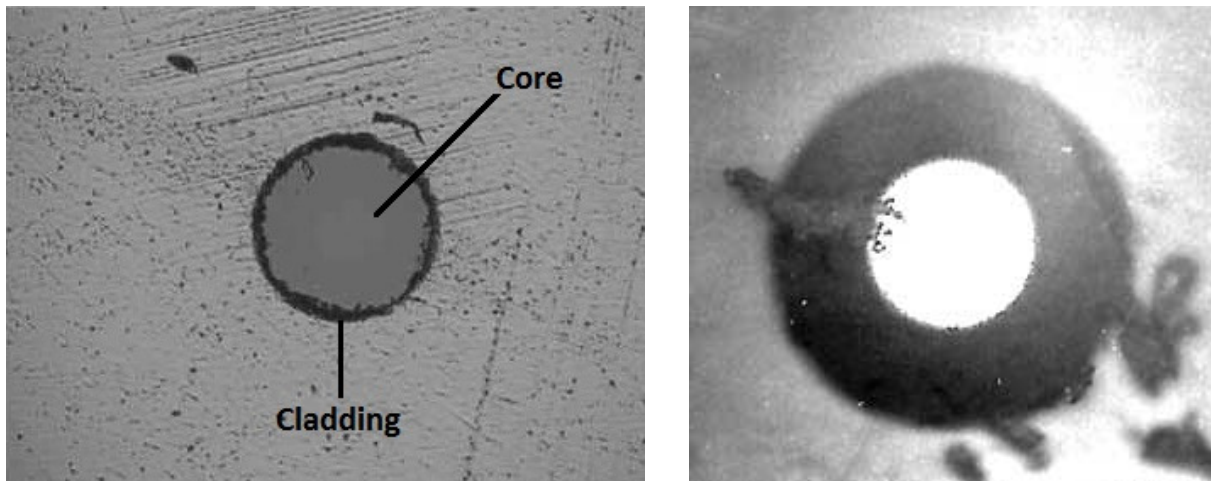
## Chapter 15 — Fiber Inspection

### Introduction

Inspection of fiber optic connections is essential to ensure the performance and longevity of fiber-optic connectivity. Throughout their lives, fiber connectors must be inspected, analyzed, and cleaned to maintain an acceptable level of functionality. The E7000L SitePROFILER makes it fast and easy to troubleshoot and certify that every connection at a cell site is optimized for enduring performance.

The instrument supports a handheld fiber probe accessory, which is used to capture video images from the sensor, analyze the images for fiber-end face defects and contamination, and provide reliable PASS/FAIL results to guarantee the performance of your optical connections.

**NOTE: Effective use of the Fiber Inspection mode requires the external fiber probe (PN: DI-1000LP). All instructions in this chapter assume that the probe is connected to the instrument via the USB port on the instrument's top panel.**



*Examples of fiber inspection: showing structure of line (left); contaminated by dirt (right).*

### 15-1 Using the Fiber Scope

The following is a step-by-step guide to inspecting optical fiber health with the E7000L SitePROFILER cable analyzer and the fiber probe.

#### Procedure:

1. To set the instrument in the Fiber Inspection mode, press the **Menu** button to view the measurement mode desktop. Tap the **Fiber Microscope** softkey.
2. Connect the fiber to be inspected to the tip of your microscope. The live video feed will appear on the instrument's measurement display.
3. Tap the **Display** main menu key. Tap **Brightness** and use arrow keys, rotary knob, or data keypad to adjust the brightness of the image. Press Enter to confirm. Repeat for **Contrast** and **Sharpness**.
4. As you inspect the fiber quality, you can toggle **Run/Hold** on the left side of the display (or under the **Measurement** main menu) to freeze the current image. Press the **Save** button to save the image to internal memory as a .BMP or .FMI file.
5. For more on saving measurement data/images, see Section 17-2.

## Chapter 16 — Markers and Limit Lines

### Introduction

When you have successfully completed a measurement and wish to analyze the results, several options are open to you. Activating markers or marker functions will provide you with a readout of the RF measurement at a specific point, giving you the amplitude reading at a given frequency. Setting limit lines enables a quick “pass/fail” analysis of the reflection performance.

### 16-1 Setting a Marker

A marker is a tool for extracting results from traces (or from trace memory). Among other functions, markers can be used to measure the amplitude of a spike on a cable analyzer measurement, or to indicate certain places on the sweep. Using markers and delta markers, you can make many measurements that deal with the change in power with frequency or time.

To set one or more independent markers on the measurement display, tap the **Marker** main menu softkey. Ensure that the Marker submenu is open and follow the steps below.

In the menu on the right-hand side of the screen, you can toggle Marker 1 and Marker 2 On/Off. Whichever marker you last selected will be the **active marker**, indicated by a small green square (■) next to its name in the Marker menu. The active marker can be freely moved along the measurement trace with the arrow keys or rotary knob. You may also use the data keypad to enter a numerical position in distance units; enter the value, then tap the desired unit (km, m, cm, or mm) in the submenu that appears to the right.

**NOTE: Although multiple markers (up to eight) can be turned on, only one can be the current active marker (meaning that this marker can be moved, the mode changed, etc). All other markers, although on, are frozen in the spot they were placed at the time they were activated.**

A **Delta** marker is associated with a Normal marker. A Normal marker must be set before a Delta marker is set. When the Delta marker is set, the position set by the Delta marker becomes the reference position of the Normal marker, and the marker's X and Y values display the difference compared with the Delta marker. The reference position will be fixed.

Tap **Marker Table** to toggle it On/Off; this setting displays a list of currently placed markers and their positions underneath the measurement display. Select **Large Display** to show only the active marker's location in larger type.

Tap **All Markers OFF** to disable all placed markers. Markers turned off and back on will retain their position. Open the More Markers submenu to set additional markers. You can set up to eight markers at a time.

#### Using Marker Auto Search

In the Marker main menu, tap **Search** to open the Search submenu. These functions can be used to automatically guide the active marker to the highest or lowest point of the measurement (**Marker to MAX/MIN**), to particular peaks and valleys (**Marker to Peak/Valley**), or to fault points (**Auto Search Fault Point**).

## 16-2 Setting a Limit Line

Limit lines can be used for setting pass/fail criteria, or simply for the user's visual reference. Limit failures are reported whenever a signal is above the upper limit line or below the lower limit line. Two types of limit lines can be specified: lower limit lines and upper limit lines.

A limit line may consist of a single segment or as many as 40 segments. These limit segments are retained regardless of the current frequency span of the instrument, which allows the configuring of specific limit envelopes at various frequencies of interest – without having to re-configure them each time the frequency is changed.

An upper (MAX) limit will automatically mark red any regions of the measurement that are higher than specified, and will display a FAIL sign. A lower (MIN) limit will do the same for any regions lower than specified. To set one or more limit lines on the measurement display, press the **Limit** (#6) datakey or tap the Limit menu key along the bottom of the display.

Limit function may differ depending on the active measurement mode. For instance, power meter limit lines appear as borders of a green zone on the meter, indicating the region of "pass" (within-limit) values. The following instructions apply chiefly to limit function within the Cable Analyzer measurement mode.

### Setting a Single Limit Line

1. First, in the Limit menu, toggle **Limit Test** to ON to display the limit line in red.
2. Tap the **Single Limit** softkey to open a submenu. Here you can select **MAX** to set an upper limit, **MIN** to set a lower limit, or **OFF** to cancel and return.
3. Tap **Single Value** to set the limit line's position. Use the arrow keys, rotary knob, or data keypad to adjust, then press Enter to confirm.

### Setting Multiple Limit Lines

1. In the Limit menu, tap **Single Limit** and select **OFF**.
2. Tap **Edit Limit**. The display will shrink to accommodate a preview of the current measurement and a limit table.
3. Tap **Add** to add a new limit line to the table. From left to right, you can tap each field to adjust it using the arrow keys, rotary knob, or data keypad. Tap a field once to outline it, and again to edit.
  - a. **Type**: Choose OFF to turn off the limit, MIN to set an upper limit, or MAX to set a lower limit.
  - b. **Begin Distance**: Set the distance at which the limit will begin testing for pass/fail. Enter a value, then select the intended distance unit: km, m, cm, or mm.
  - c. **End Distance**: Set the distance at which the limit will stop testing for pass/fail.
  - d. **Begin Amplitude**: Set the amplitude (how high/low) for the start of the limit line. You can use this feature to set a limit that rises or falls at various points through the measurement.
  - e. **End Amplitude**: Set the amplitude (how high/low) for the end of the limit line.
4. Tap anywhere on an unwanted limit line in the table and tap **Delete** to erase it.
5. You may set up to 20 limit lines. When you are finished, tap **Return** to go back.

### Limit Alarm

If active, the Limit Alarm feature notifies the user with a series of audible beeps if the current measurement exceeds a placed limit line. Simply tap the Limit Alarm softkey to toggle it ON or OFF.

## Chapter 17 — File Management

### Introduction

This chapter provides an overview of the E7000L SitePROFILER's file management features, and describes the **File Manager** (shown below) and **File Save** menus.

The instrument can automatically store parameters. Once the instrument is powered on, it will automatically recover the pre-shutdown state. This simplifies the setup process. The user can also set the instrument state by saving configuration files that contain the instrument's measurement mode, frequency, distance, markers, and other parameters and calibration data at a particular point in time.

Stored measurement files can be used for managing measurement results. Users can load previous measurements into the instrument's internal memory to compare or calculate data; then import multiple results into the PC management software for detailed analyses, data management, and report generation.




### 17-1 Overview

Remember the following tips when reviewing Chapter 17, "File Management":

- Saved measurements also contain setup information.
- Read measurements may change the current instrument settings (which will not be saved) in order to display the read measurement.
- Calibration information is read with setup files, but not recalled with measurement files.
- Rename saved files under the file management (**File > File Manager**) menu.
- Sort files by tapping the column headings.
- Quickly move up or down long lists by using the buttons under the **Navigation** submenu.
- Determine where files are saved (either Internal Memory or USB) with the Set Location button in the **File Save** submenu (Save > Location).
- Use the **Right** arrow key to visit a highlighted folder, and the **Left** arrow key to exit the folder.
- Press **Esc** to return to the previous screen.

## 17-2 Saving Files

### 17-2.1 — Naming a File

Access the **File Save** screen by pressing the  icon at the top of the display, or the **Save** key on the top-right of the instrument (underneath **Menu**). From this screen, you may save your current system settings, traces, or screenshots. Once you have successfully determined the filename, type, and location, press the Save softkey on the right side of the File Save menu to finish.



#### Entering a filename

Tap the empty field next to File Name. A white cursor will flash, indicating you are ready to type.

Use the keypad on the bottom of the screen to enter the file name. Tap the softkey marked "123@" to type numbers and special characters. The file name can include letters, numbers, spaces, and a limited selection of special characters. Note that the maximum length is 40 characters.

(For typing shortcuts and additional options, see **Using the X Name Softkeys** below.)

#### Using the X Name Softkeys

The **X Name Page 1** and **X Name Page 2** softkeys open a selection of customizable keys for naming files. If the user must frequently save files about antenna use, the "Antenna" key on X Name Page 1 will enter the entire word at once. Use these keys to save time while conducting field operations.

To customize your X Name softkeys, simply open X Name Page 1 or 2 and tap **Rename Keys** on the right side of the display. Choose a key to rename, and type your desired entry with the touchscreen keyboard. Then tap **Done** to save it and **Finish** to exit.

Toggle Separator **On** or **Off** to automatically insert a dash ("-") or underscore ("\_") between words, e.g. "loadsystem" vs. "load\_system".

## 17-2.2 — File Types

The file type bar contains two buttons: **Setup** and **Image**. Select the type of file you wish to save by tapping a button; your current selection will be highlighted green.



- Setup files – configurations of the current measurement mode of the instrument, frequency and distance parameters, marker placement, etc..

**NOTE: By using configuration files wisely, the user can restore the instrument to a previous state. This feature reduces time spent repeating setup and calibration steps.**

- Measurement – measurement data, readable by compatible software. See below for formats.
- Image files – screenshots of the display at the time the **ScrnShot** key was pressed.

### File Extensions

The table below lists the various types of files that can be saved. Each type of file has a different suffix, which will follow the filename you enter. (For example, an image named "my\_measurement" will be saved as "my\_measurement.bmp".)

File Type	Suffix
Measurement file – VSMR	.SWR
Measurement file – return loss	.RTL
Measurement file – cable loss	.CBL
Measurement file – DTF-VSWR	.DVS
Measurement file – DTF-return loss	.DRL
Measurement file – fiber scope	.FMI

File Type	Suffix
Measurement file – phase	.PHA
Measurement file – Smith Chart	.SMI
Measurement file – power meter	.PMM
Setup file	.STP
Image file	.BMP

## 17-2.3 — Location

The file location bar contains two buttons: **Local Disk** and **USB Disk**. Select where you wish to save the file by tapping a button; your current selection will be highlighted green.



- Local Disk – file will be saved to the instrument's internal memory.
- USB Disk – file will be saved to the currently connected USB device. Must have a USB memory stick inserted into the USB Type-A connector on the instrument's top panel.

Once you have successfully determined the filename, type, and location, press the **Save** softkey on the right side of the **File Save** menu to finish.

## 17-3 Managing Files

Access the **File Manager** screen by pressing the **File** (#1) key on the data keypad. From this screen, you may view the system configurations, measurement data, images, and other files currently saved to the instrument or a connected USB device.

You can organize, move, or delete these files as desired.

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### 17-3.1 — Viewing Files

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Like the **File Save** screen (see Section 17-2), the File Manager screen has fields for file name, file type, and location. Here, they are best navigated in reverse order: first **Location**, then **Type**, then **Filename**.

#### Location

Contains two softkeys: Local Disk and USB Disk. Tap a softkey to choose which disk to read files on: the instrument's internal memory or a connected USB device.

#### Type

Contains five softkeys:

- **Setup.** Setup configuration files can include active measurement mode of the instrument, frequency/distance, marker placement, and other parameters and calibration data.
- **Meas.** Measurement files contain all information in the current field and the measurement data.
- **Trace.** Trace files contain saved measurement traces.
- **Report.** Report files contain reports based on collected trace data. Reports can be generated using the Deviser Site Workbench Software; please see Chapter 9 – Deviser Software Tools for more information.
- **Image.** The ScrnShot function saves a screenshot of the current display and saves it as an image. The image can be previewed from the instrument using the Preview softkey in the top right-hand corner of the File Manager display.

Tap a softkey to view all the files of that type stored on the disk.

#### File Name

Displays the currently selected file's name.

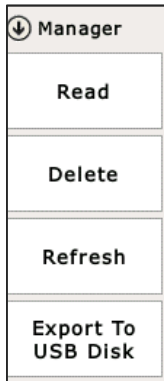
The files meeting your specifications will appear in the list below these fields. Tap a file's name to select it for further action. You can also rearrange files, using the instrument's navigation tools (see subsection 17-3.3) or the sortbar that runs horizontally above the file list. The sortbar contains headers such as file name, size, and save date (when the file was created or modified). Use these headers to change the order of the file list based on alphabetical order, age, etc.

For example, tap "File Size" once and an up-arrow will appear. This indicates that your files are now being displayed according to size, from smallest to largest. Tap the key again to reverse the order and display from largest to smallest.

Each file is listed with a checkbox icon under the column marked **Selected**. You can check multiple boxes in order to select many files at once. (You cannot read/preview more than one file at a time.) Check the box next to "Selected" to select all files in the list.

## 17-3.2 — Manager Tools

When you have selected one or more files, the **Manager** submenu opens. This menu lists management options for your files. They are detailed below.

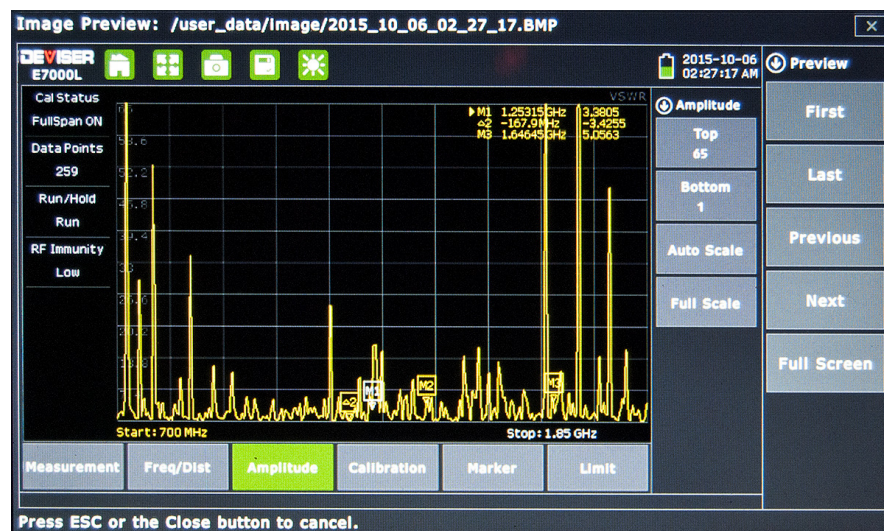


**Read/Preview:** Loads selected files from internal memory. Images can be previewed to display them on the instrument's display. Use the Preview submenu (shown below) to navigate through images, or tap Full Screen to expand the image for better viewing.

**Delete:** Erases selected files from the disk.

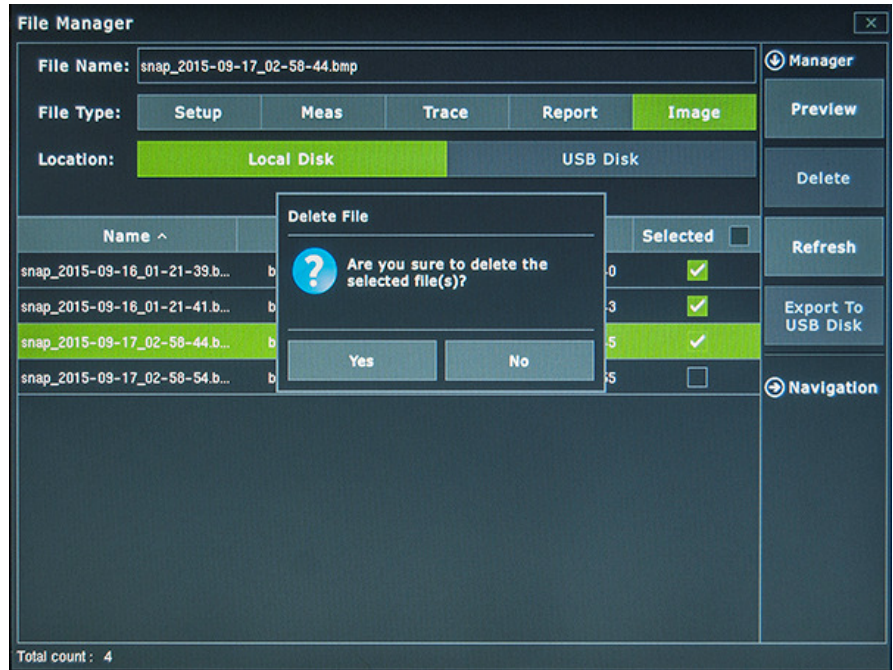
**Refresh:** Updates the file list to reflect all recent changes to stored data.

**Export to USB Disk / Import to Local Disk:** Moves selected files from the instrument's internal memory to a connected USB storage device, or vice-versa.



*Previewing a saved screenshot*





**Marking Multiple Items for Deletion**

17-3.3 — Navigation Tools

Under the **Manager** submenu key, tap the **Navigation** submenu key to open the Navigation submenu. These tools enable you to quickly sift through long lists of saved files. They are detailed below.

Navigation
Top
Bottom
Page Up
Page Down

- Top:** Selects the first file listed.
- Bottom:** Selects the last file listed.
- Page Up:** Scrolls to previous page of files.
- Page Down:** Scrolls to next page of files.

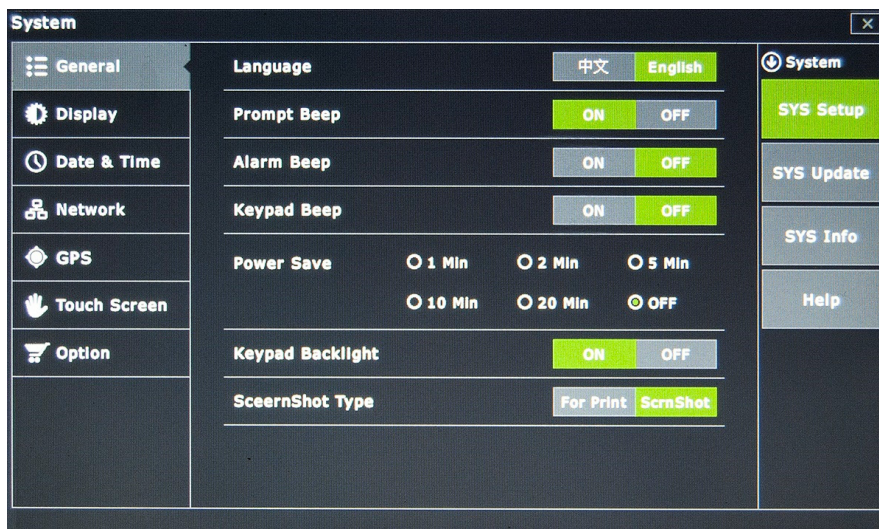
## Chapter 18 — System Operations

### Introduction

This chapter provides an overview of E7000L system operations, including:

- System configuration
- Service operations
- Display language
- Date/time setup
- Network setup
- System testing
- System information
- System update

The System menu contains system setup options, information about the instrument, system upgrade functions, and the help menu. When the user selects a function by tapping it, it will open a sub-menu for the user to set parameters or make other edits.



*System Menu: General Settings*

Press the **System** (#8) data key to enter the main System menu. Its functions are detailed below.



- SYS Setup:** Opens the "Setup" submenu. See Section 18-1 for details.
- SYS Update:** Opens the "Update" submenu. See Section 18-2 for details.
- SYS Info:** Opens the "System Information" submenu. See Section 18-3 for details.
- Help:** Opens System Help. See Section 18-4 for details.

## 18-1 System Setup



- General:** View and change general system settings.
- Display:** Change display brightness and color scheme, and toggle visual measurement aids on or off.
- Date & Time:** View and update the system's internal clock.
- Network:** Change the system's networking settings.
- GPS:** Enable or test the instrument's GPS functionality.
- Touch Screen:** Re-calibrate the instrument's touchscreen.
- Options:** Enter serial numbers for optional features that the user has purchased from Deviser for the E7000L.

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### 18-1.1 — General System Settings

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Within the **System** menu, tap the **General** softkey to open the general settings submenu.

#### Language

Tap to highlight English or Chinese as your preferred language. All system text will appear in the language of your choice.

#### Prompt Beep

For the completion of some specific actions, the system will issue a short beep to prompt the user.

#### Alarm Beep

The system will issue an alert beep if an invalid value is entered.

#### Power Save / Keypad Backlight

To conserve battery power, you may choose to have the instrument's display automatically dim if no input is made after a given period of time. If you turn OFF the power-save option, the screen will remain bright as long as the instrument is on. The data keypad backlight can also be toggled ON or OFF.

#### ScrnShot Type

The instrument can capture screenshots in a color-edited form optimized for printing. Select "For Print" to take screenshots with dark text on white background, or "Scrnshot" for white text on dark background.

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## 18-1.2 — Display

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**Brightness**

Tap an option (5%, 25%, 50%, 75%, or 100%) to adjust the brightness of the display backlight.

**Sweep Line**

Toggle the sweep line feature ON or OFF.

**Grid**

Toggle the gray measurement grid ON or OFF.

**Prompt**

Toggle the entry prompt ON or OFF.

---

## 18-1.3 — Date and Time

---

**Date**

Set the day, month, and year of the instrument's internal clock. Tap the entry field and use the touchscreen keyboard, data keypad, Up/Down arrow keys, or rotary knob to enter the current date.

**Date Format**

Determine the order in which the day, month, and year are displayed.

**Time**

Set the hour, minute, and second of the instrument's internal clock. Tap the entry field and use the touchscreen keyboard, data keypad, Up/Down arrow keys, or rotary knob to enter the current time.

**Time Format**

Determine whether to display the current time on a 12-hour or 24-hour rotation (e.g., 7:00 pm or 19:00).

**Time Zone**

Adjust the system clock by selecting your current time zone and Daylight Savings Time setting. Press Enter to save your changes.

18-1.4 — Network



In the **Network** submenu, you will find options for setting network communication information. Enter the IP address at the bottom of the screen, using the data keypad. Press the Enter key to complete the setup. At this time, the instrument's default IP address is 192.168.0.138.

18-1.5 — GPS

**GPS Enable**

Toggle the instrument's Global Positioning System functions ON or OFF.

**GPS Test**

Tap **Start** to begin a brief test to determine if the GPS is functioning correctly. If no location information is received, three gray horizontal lines will be displayed ("---"). Verify that the GPS antenna can access all necessary equipment, and that the outdoor antenna is not obstructed by other objects.

18-1.6 — Touch Screen

**Calibrate**

Calibrate the touchscreen if the user's input / softkey taps are not properly registered. Tap **Start** and follow the on-screen instructions to re-calibrate the touch screen. Use the included touchscreen stylus for the most accurate results.

After the calibration procedure, press Enter to accept the recalibration or Esc to cancel.

**Cursor**

When this option is toggled ON, the instrument will display a pointer arrow (cursor) that can be used to indicate a softkey selection instead of tapping. Move the cursor with the directional arrow keys above the keypad, and press Enter to "click" the desired softkey. When a message box is displayed, the left or right arrows keys can be used to make a selection.

**NOTE: 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.**

## 18-1.7 — Option

**Enter keys**

```
FF1DB8B416B1A0E16CE445D570C060F3AC2F830CC  
E4B76932BFFCD847022C18F  
38BCE4F4BCF6425A631FE612DEF413F4A13C60DCE6  
019B8708E0C8E8E2749725T
```

**Load** **Enter**

---

**Note:**  
Press the **Load** button to load keys from keys.txt at the root path of the USB Disk.

The E7000L SitePROFILER be configured with additional measurement modes at the time of purchase, or at a later date in the field, as your test needs evolve. These software-enabled product measurement options can be added to the instrument in the **Option** submenu.

In order to enable your additional product options, you will need the serial number you received upon purchasing the option. There are two ways to enter this number:

- In the Option submenu, tap the large entry field. Use the touchscreen keyboard to type the serial number of your option. Tap the softkey marked **Enter** to confirm.
- Using the Type-A USB connector on the instrument's top panel, connect a USB storage device containing the serial number. Then, tap the softkey marked **Load**.

**See Section 1-3 of this User Guide for a list of available product measurement options.**

## 18-2 System Update

On occasion, the E7000L may require software updates provided by Deviser Instruments. Deviser will notify you when an updated version of the software is released.

To apply an update, first insert a USB memory stick containing the update data into the Type-A USB connector on the instrument's top panel. (Please ensure that the update folder is placed in the root [top-level] directory of the USB device).

Press the **System** (#8) data key to access the System menu, then tap the **SYS Update** softkey and press **Start**. Do not remove the USB device until the update is completed.

After the upgrade is completed, you must restart the equipment to apply changes.

## 18-3 System Information



The **SYS Info** screen displays information about the instrument's software and hardware, including:

- Device serial number
- Operating system version
- Software version
- DSP version
- Battery status
- Current internal temperature
- Available storage space in internal memory

## Chapter 19 — Deviser Software Tools

### Introduction

This chapter provides an overview of the Site Workbench software. The "Deviser Site Workbench" Software Tools is a program for transferring and editing saved measurements, markers, and limit lines between a Deviser Instruments test-and-measurement device and a PC.

Site Workbench is compatible with Microsoft Windows 2000, Windows XP, and Windows 7 versions; it is not compatible with earlier versions of the Microsoft Windows operating system. For detailed information, please refer to the Site Workbench manual.

### 19-1 Feature Overview

#### Display and Analyze Traces

Site Workbench can read files saved by the measurement equipment. It can also display the measurement traces and analyze data. Site Workbench enables users to edit markers and limit lines from a PC – as well as changing the trace of the scale.

#### Context Menu

Access Site Workbench's context menus by right-clicking on an active measurement screen in the graphic display editor window. Among other functions, users can edit images from this menu.

#### Editor Features

The software includes a cable editor, the signal standard editor, and other commonly-used editing tools. You can upload and download data from the instrument as well.

#### Remote Control Software

Site Workbench's remote-access tools enable users to carry out test and measurement procedures remotely through their Deviser equipment.

#### Superimposed Trace

This feature allows the user to compare multiple measurement traces in the same view pane.

### 19-2 Installing Site Workbench

Site Workbench is provided on the CD-ROM included with the equipment. Insert the CD-ROM into a PC to run the installer. Follow the instructions on screen to install Site Workbench on your computer.

### 19-3 Connecting to the E7000L Cable Analyzer

Use a crossover network cable (included with the instrument) to connect to a PC via the following steps:

1. Plug the network cable into the network port in the instrument's top panel. Connect the other end to the network port on your PC.
2. Press the **ON/OFF** button on the instrument to power it on. Confirm the instrument's IP address.
  - a. Press the **System** (#8) data key to open the System menu, then open the **Network** submenu.
  - b. Next to "IP Address", the field should read 192.168.0.138. If it does not, re-enter the IP address.
3. On your PC, run the Site Workbench management software. When prompted, enter the IP address of the connected instrument.
4. Press **Connect** to begin the connection.



## Chapter 20 — Specifications

Frequency	
Frequency Range	2 MHz – 4.4 GHz
Resolution	0.5 kHz

Measurement Speed	
Reflection	< 1.0 mS/point
DTF	< 1.25 mS/point
Data Points	130, 259, 517, 1033, 2065

Measurement Accuracy	
Corrected Directivity	42 dB (typical, after standard OSL calibration) 38 dB (typical, after eCAL calibration)

Output Power	
0 dBm (Nominal)	

Interference Immunity	
On-channel	+18 dBm, >1 MHz of carrier frequency
Off-channel	+13 dBm, ±10 kHz of carrier frequency

Measurements	
Return Loss	0 to 60dB (Resolution 0.01 dB)
VSWR	1:1 to 65:1
Cable Loss	0 to 30 dB (Resolution 0.01 dB)
DTF Range (Distance)	1500 meters (4921 feet)

Connectors (Reflection/RF Out)	
RF Out	Type N, female, 50Ω
RF Out Damage Level	25 dBm, ± 50 VDC

Connectivity	
USB host	USB 2.0 Type A
USB client	5-pin mini-B (connect to PC for data transfer)
LAN	RJ45 10M/100M LAN Ethernet Port

Display	
Type/Size	TFT LCD / 7.0" (800x480)

Data Storage	
Internal	1 GB, >2000 saved measurement files
External	Limited by size of USB flash drive

Battery	
Type	Li-Ion, 7.4V, 7.5AH
Operation	TYP.> 8.0 hrs, continuous

Environmental	
Operating Temperature	-10°C to +55°C
Storage Temperature	-40°C to +80°C
Maximum Humidity	95% RH (non-condensing) @ 40°C
Shock	Mil-PRF-28800F Class
Altitude	4600 meters, operating and non-operating

EMC	
European EMC	IEC/EN 61326-1:2006

AC Power	
AC Adapter Output	11-14 VDC
AC Adapter Input	100-240 VAC, 50-60 Hz

Size & Weight	
Size	245mm x 190mm x 75mm (9.64in x 7.48in x 2.95in)
Weight	2 kg (4.4 lbs)

**For a list of software-enabled measurement options available from Deviser, please see Section 1-3.**

**For a list of compatible accessories, please see Section 1-4.**



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