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CAA06M

Cable and Antenna Analyzer

User's Guide



Table of Contents

About CAA06M Cable and Antenna Analyzer	1
CAA06M Cable and Antenna Analyzer	1
Safety and compliance information	2
Safety consideration	2
Guide conventions	4
Technical assistance	6
Introduction to CAA06M	7
What is CAA06M Cable and Antenna Analyzer?	7
Features and capabilities	9
Features	9
Capabilities	10
Specifications	10
Physical specifications	10
Power supply specifications	10
Environmental specifications	10
Options	11
Getting Started	13
Unpacking and inspecting CAA06M Cable and Antenna Analyzer	13
Installing Dual Module Carrier and CAA06M Cable and Antenna Analyzer	13
Navigating the user interface	15
Glancing at menus and icons	15
Setting up the instrument	17
Enabling software options	17
Performing Calibration	19
Introduction	19
Understanding calibration	19

Calibration tools	19
Performing 1-port Calibration	19
O-S-L calibration using mechanical Y-Cal kit	19
O-S-L calibration using electronic EZ-Cal kit	21
Quick calibration	23
Performing 2-port Calibration	23
Thru calibration	24
Reflection Test	25
Introduction	25
Introducing reflection measurement	25
Preparing for a measurement.....	27
Selecting measurement mode	27
Setting parameters.....	27
Making a measurement.....	29
Procedure	29
Analyzing measurement results.....	30
DTF Testing.....	35
Introduction	35
Introducing DTF measurements	35
Preparing for a measurement.....	36
Selecting measurement mode	36
Setting parameters.....	36
Making a measurement.....	40
Procedure	40
Analyzing measurement results.....	41
1-Port Cable Loss Testing.....	45
Introduction	45

Introducing 1-port cable loss measurements	45
Preparing for measurement.....	46
Selecting measurement mode	46
Setting parameters.....	46
Making a measurement	48
Procedure	48
Analyzing measurement results.....	49
1-Port Phase Testing	51
Introduction	51
Introducing 1-port phase measurements.....	51
Preparing for a measurement.....	52
Selecting measurement mode	52
Setting parameters.....	52
Making a measurement	54
Procedure	54
Analyzing measurement results.....	55
Smith Chart Testing	57
Introduction	57
Introducing Smith chart measurements.....	57
Preparing for a measurement.....	58
Selecting measurement mode	58
Setting parameters.....	58
Making a measurement	60
Procedure	60
Analyzing measurement results.....	60
2-Port Transmission Testing	63
Introduction	63

Introducing 2-port transmission measurement	63
Gain.....	63
Insertion loss	63
Preparing for a measurement.....	64
Selecting measurement mode	64
Setting parameters.....	64
Making a measurement	67
Procedure	67
Analyzing measurement results.....	67
CW Signal Generating	69
Introduction	69
Introducing RF source	69
Using RF source.....	70
Selecting measurement mode	70
Turning on RF source	70
Analysis	71
Introduction	71
Using zoom zones	71
Setting sub-band frequency	71
Tips for zoom zones.....	71
Using alternate DTF band	72
Setting alternate DTF band.....	72
Using markers	73
Setting a marker.....	74
Moving, hiding, and clearing a marker.....	75
Searching for peak or valley	75
Finding a peak or valley	76

Finding a peak or valley in zoom zones.....	76
Displaying traces	76
Adding a trace	76
Performing trace math	77
Loading a saved trace.....	77
Setting test limits	78
Setting a limit line	78
Setting a Multi Segment limit Line	79
Setting a limit window	81
Holding a measurement	82
Appendix	83
A. Ordering information.....	83
B. RoHS information	85

About CAA06M Cable and Antenna Analyzer

CAA06M

Cable and Antenna Analyzer

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Open source disclaimer - IMPORTANT READ CAREFULLY

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Safety and compliance information

Safety consideration

It is mandatory to permanently connect this product to the protective earth.

When powering this instrument externally, always use an AC power cable that includes an earth (safety) ground connection, which is shipped with your instrument.

The authority to operate this product is conditioned by the requirements that no modifications be made to the equipment unless the changes or modifications are expressly approved by VIAVI.

Caution:

- To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all person.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada requirements

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This Class A digital apparatus complies with Canadian standard ICES-003.

Le présent appareil numérique de classe A est conforme à la norme ICES-003 du Canada.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Device operation in the band 5150–5250 MHz is for indoor use only.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: 1) l'appareil ne doit pas produire de brouillage; et, 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Dans la bande de fréquence 5150-5250 Mhz, l'utilisation du produit doit être uniquement en intérieur.

Japan Ministry of Internal Affairs and Communications (MIC) Requirements

This device is compliant with Japan's Radio Law and the Technical Conformity (Giteki) Mark can be viewed on the instrument's display screen. The [telec.pdf](#) file containing the conformity mark is located in the files/disk/licenses folder under the System menu.

EU WEEE and battery directives

This product, and the batteries used to power the product, should not be disposed of as unsorted municipal waste and should be collected separately and disposed of according to your national regulations.

VIAVI has established a take-back processes in compliance with the EU Waste Electrical and Electronic Equipment (WEEE) Directive, 2012/19/EU, and the EU Battery Directive, 2006/66/EC.

Instructions for returning waste equipment and batteries to VIAVI can be found in the WEEE section of [VIAVI Standards and Policies web page](#).

If you have questions concerning disposal of your equipment or batteries, contact VIAVI WEEE Program Management team at WEEE.EMEA@ViaviSolutions.com.

EU REACH

Article 33 of EU REACH regulation (EC) No 1907/2006 requires article suppliers to provide information if a listed Substances of Very High Concern (SVHC) is present in an article above a certain threshold.

For information on the presence of REACH SVHCs in VIAVI products, see the Hazardous Substance Control section of [VIAVI Standards and Policies web page](#).

EU CE marketing directives (LV, EMC, RoHS, RE)

This product conforms with all applicable CE marking directives. Please see EU Declaration of Conformity for details.

EU Radio Equipment Directive

In accordance with Article 10.8 of the EU Radio Equipment Directive 2014/53/EU, the following table provides information on the frequency bands and the maximum RF transmit power of this product for sale in the EU:

Frequency range (MHz)	Channels Used	Max. Transmit Power (dBm/mW)
5470-5725	100-140	29.9 dBm (977 mW) with TPC 26.9 dBm (490 mW) non-TPC
5250-5350	52-64	22.9 dBm (195 mW) with TPC 19.9 dBm (97.7 mW) with TPC
5150-5250	36-48	22.9 dBm (195 mW)
2400-2483.5	1-13	ODFM: 19.9 dBm (97.7 mW) CCK: 17.9 dBm (61.7 mW)

TPC: Transmit Power Control








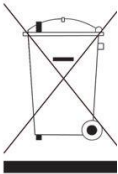
Guide conventions

This guide uses the following conventions:

Typographical conventions

Description	Example
Buttons that the user presses or tap on a physical device	Press the ON button.
Screen buttons, menus, icons, and options that you tab/select on the touch-screen in this typeface	Tap the Apply button. Tap Limit line to turn on. Go to Settings . Select Channel standard .
A single slanted bracket (>) indicates choosing a submenu from a menu.	On the menu bar, click File > Save .
A file type in <i>this typeface</i> .	In <i>.trav</i> file type

Symbol conventions

Items	Descriptions
	This symbol indicates a note that includes important supplemental information or tips related to the main text.
	This symbol represents a general hazard. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message.
	This symbol represents an alert. It indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.
	This symbol represents hazardous voltages. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message.
	This symbol represents a risk of explosion. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message.
	This symbol represents a risk of a hot surface. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message.
	This symbol represents a risk associated with fiber optic lasers. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message
	This symbol, located on the equipment, battery, or the packaging indicates that the equipment or battery must not be disposed of in a land-fill site or as municipal waste, and should be disposed of according to your national regulations.

Safety definitions

Term	Definition
NOTE	Indicates important supplemental information or tips related to the main text.
DANGER	Indicates a potentially hazardous situation that, if not avoided, will result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol.
WARNING	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. It may be associated with either a general hazard, high voltage, or other symbol.
CAUTION	Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury and/or damage to equipment. It may be associated with either a general hazard, high voltage, or risk of explosion symbol. When applied to software actions, indicates a situation that, if not avoided, could result in loss of data or a disruption of software operation.

ALERT	Indicates that there is an action that must be performed in order to protect equipment and data or to avoid software damage and service interruption.
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Technical assistance

If you require technical assistance, call 1-844-GO-VIAVI or send an email to TAC@viavisolutions.com.
For the latest TAC information, go to <http://www.viavisolutions.com/en/services-and-support/support/technical-assistance>.

Introduction to CAA06M

What is CAA06M Cable and Antenna Analyzer?

The majority of problems in mobile networks occur at the base station infrastructure that is consisted of the antenna system, cables, and connectors. It is essential to have the optimal instrument for properly servicing or installing cell sites.

The CAA06M analyzer is the optimal test solution to characterize cell site's infrastructure due to its ease of use and rich functionality.

The CAA06M analyzer has all of the measurement functions necessary to accurately verify the site's transmission line and antenna system from signal reflections (VSWR or Return Loss) to DTF (Distance to Fault) measurement function.

CAA06M Cable and Antenna Analyzer



Top panel view



No.	Description
1	Reflection / RF Out port: Reflection and RF out 50-Ohms port.
2	Bias Voltage port: You can use this SMA type female connector to supply bias voltage from +12 VDC to +30 VDC with maximum 6 Watts.

Features and capabilities

The CAA06M Cable and Antenna Analyzer is the optimal portable test solution for installation and maintenance of cellular base stations and cell sites, running with external AC power or battery for the field. Its touch-based user interface has been specifically designed with customized menus and simple calibration procedures, providing service providers with accurate and reliable measurement results.

Features

- Up to 2001 data points to locate long distance problems
- Dual display to view multiple measurements simultaneously to reduce test time
- Powerful application software for data management (JDViewer, StrataSync)
- Full remote control of the instrument from VNC on computers and mobile devices

Capabilities

- Reflection measurement in VSWR, Return Loss, or Smith Chart
- DTF (Distance to Fault) measurement in VSWR or Return Loss
- 1 Port Cable Loss measurement and 1 Port Phase measurement
- Report generation in PDF and directly on the instrument
- 2 Port Transmission (gain/insertion loss) measurement
- RF Source Bias Voltage

Specifications

The physical, power supply, and environmental characteristics for the CAA06M Cable and Antenna Analyzer (installed at CellAdvisor 5G) are listed in the tables below.

Physical specifications

Product	Dimension (H x W x D), Weight
CAA06M Cable and Antenna Analyzer	130 mm x 138 mm x 41 mm, 0.43 kg for CAA06MA (0.45 kg for CAA06MB)
(CellAdvisor 5G with CAA06M Cable and Antenna Analyzer)	(309 mm x 241.2 mm x 159.4 mm, 7.25 kg)

Power supply specifications

Power	Descriptions
DC Input	19 V DC, 8.4 A
Power consumption	Option F001 54 W Option F002 64 W

Environmental specifications

You can check the environment specifications in the following table.

Item	Descriptions
Maximum Humidity	95% RH non-condensing
Shock and Vibration	MIL-PRF-28800F Class 2
Drop	MIL-PRF-28800F Class 2
Altitude	up to 4600 m
Overvoltage category	Overvoltage category OVC1
Pollution degree	Pollution degree 2
Operation Temperature	-10 to 55°C
Storage Temperature	-40 to 70°C

Options

This instrument is provided with various options/features that are available to be ordered. See “[Appendix A. Ordering information](#)” for more information.

Getting Started

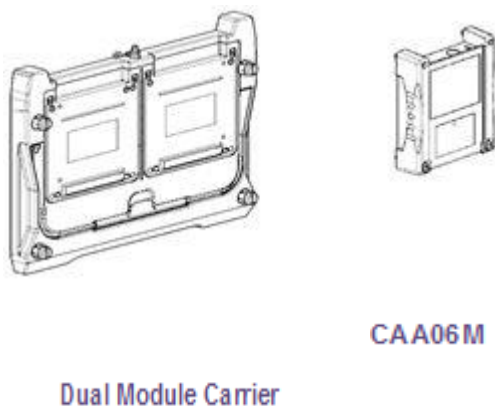
Unpacking and inspecting CAA06M Cable and Antenna Analyzer

VIAVI ships our instruments using anti-static packing material to stabilize the components inside the box. When unpacking the components, verify that all the items you ordered are included in the package. After you unpack the components, you should inspect them for damage. If undamaged, consider saving the box and packing materials in case you need to repackage the components for shipment.

After you unpack the components, examine the CAA06M for damage. If you find damage, contact VIAVI Customer Care at 1-844-GO-VIAVI. For the latest TAC information, go to <https://www.viavisolutions.com/en-us/services-and-support/support/technical-assistance>.

CAA06M must be installed at Dual Module Carrier.

Figure 1 Dual Module Carrier with CAA06M



Installing Dual Module Carrier and CAA06M Cable and Antenna Analyzer

You need to install the Dual Module Carrier to CellAdvisor 5G if you are a CellAdvisor 5G user. Follow the instruction to install Dual Module Carrier and CAA06M.

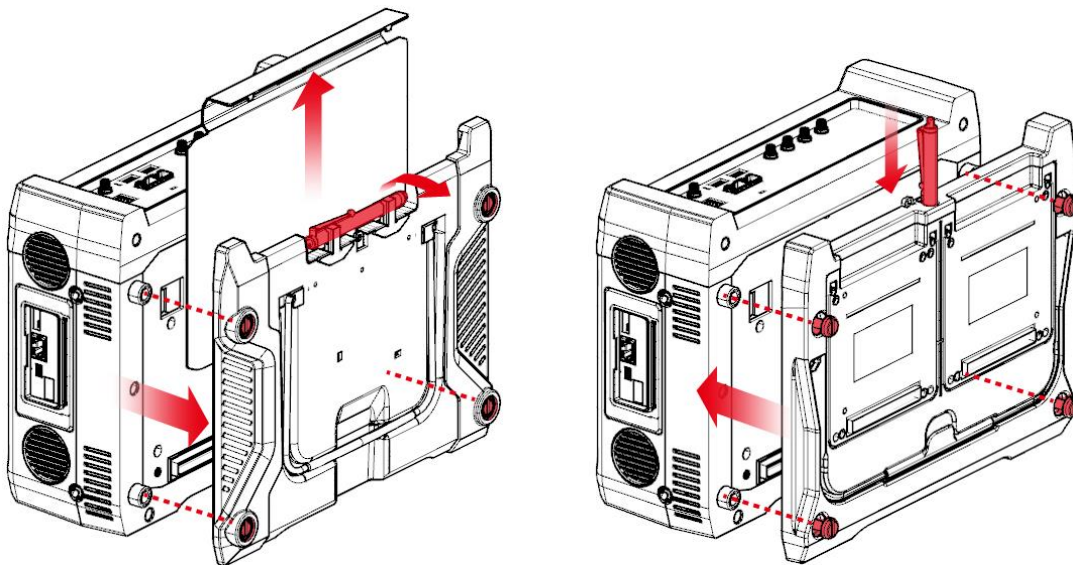
- 1 Power off your CellAdvisor 5G and untie the Stylus from CellAdvisor 5G, unscrew 4 corners of CellAdvisor 5G rear panel and LCD cover. Separate L wrench from CellAdvisor 5G rear panel and put it into the L-shaped wrench holder on Dual Module Carrier.

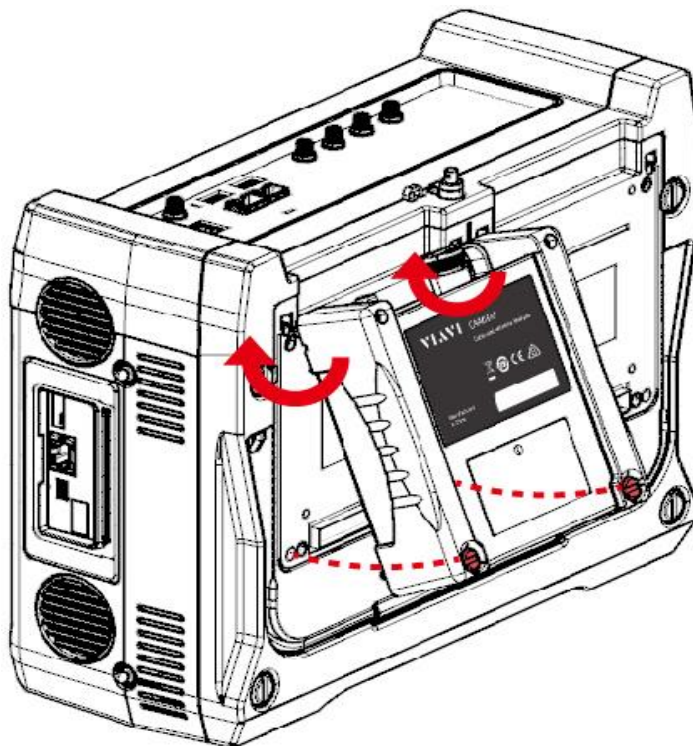
- 2 Screw the 4 corners of Dual Module Carrier to CellAdvisor 5G and tie the Stylus to Dual Module Carrier.
- 3 Put the upper hooks of CAA06M into the holes of Dual Module Carrier.
- 4 Screw the lower part of Module to Dual Module Carrier.
- 5 Install the dummy module to the connector not in use if you ordered one.
- 6 Power on your CellAdvisor 5G and perform the O-S-L Calibration by tapping the Cal in the right-side bar on the screen. The instrument displays on-screen instructions for you to follow through.

NOTE:

The dummy module is intended to protect the rear connectors on the Dual Module Carrier and it is recommended to install a dummy module for any connector not in use.

For the customer who wants to order the dummy module, the part number is C2K-EMPTYMOD.

Installing Dual Module Carrier to CellAdvisor 5G**Installing CAA06M Cable and Antenna Analyzer to Dual Module Carrier**







Navigating the user interface

Glancing at menus and icons













There are menus and icons that you need to get familiar with to operate CAA06M Cable and Antenna Analyzer efficiently.

Menus on the side bar

Items	Name	Description
	Menu	Tap to view all menus for the selected measurement and mode. Note that the Menus vary based on the selected measurement and mode.
	Full menu	Tap to view full menus for the selected measurement and mode in one screen. You can set all the parameters needed for a test at once.
	More	Tap to view more hot keys available.

	Help	Tap to view the CellAdvisor 5G Help.
-----------------------------------------------------------------------------------	-------------	--------------------------------------

Hot keys and icons on the side bar

Items	Name	Description
	Hold	Tap to hold spectrum measurement.
	Save	Tap to save the current measurement from one of the five file types: Result , Result as CSV , Setup , Report , or Screen .
	Load	Tap to load the saved measurement result file.
	Auto Scale	Tap to set the scale automatically.
	Marker Table	Tap to view the active marker with its information.
	Marker Setting	Tap to select the marker from 1 to 6 to set the marker position.
	Peak Search	Tap to set the active marker to peak. When makers are all off, M1 will be the active marker.
	Screen Capture	Tap to quick save the current screen.
	Calibration	Tap to perform calibration. The on-screen instruction appears to guide you through the calibration.
	Preset	Tap to reset the instrument to the factory default. It can be shown when you tap the more () icon on the side bar.
	System Setting	Tap to view the system information and system settings. In the System Settings, you can diagnose Tx and Rx modules by Self Test (Note . Disconnect any cable connected to the Reflection / RF Out port before Self Test). You can tap the Factory Reset button to reset your instrument.

Setting up the instrument

Enabling software options




You can enable purchased software options by using the Import Options from USB button. Please call the regional VIAVI Solutions Sales Office for more details about enabling options. They will ask you the serial number of the test instrument for which the upgrade or software option was ordered.

Viewing options

Your instrument may come with software options installed or you may order them later and install yourself.

- 1 Select the **System Setting** icon, then select **System Info**.
- 2 The options installed appears in the **Base Options** pane on the right.

The icon indicates whether the option is enabled.

Icon	Indicates
	Option is enabled.
	An expiring option. An “expiring option” is an option that is installed for free for a trial period. The time left in the trial is indicated to the right. When the trial period ends, a warning message appears. If you are running a test when the option expires, you can continue testing, but the expiration warning will reappear every minute until you either enter a permanent option code or reset the module (changing applications will reset the module).
	Option has not been enabled. If you need this option, contact regional Sales Office to place an order.

Installing software options

You can enable purchased software options by using the Import Options from USB button. Before installing the options, you need to have a USB memory stick including option files provided by VIAVI.

- 1 Select the **System Setting** icon, then select **System Info**.
- 2 Connect the USB memory stick with option files to the **USB A** or **USB B** port of the instrument.
- 3 In the lower part of the **Base Options** pane, tap the **Import Options from USB** button.
A message alerting the option file is imported appears.
- 4 Reboot the instrument and check the option is installed.

Performing Calibration

Introduction

This chapter provides instructions on how to perform calibration properly in order to obtain accurate measurement results. Topics discussed in this chapter are as follows:

- Understanding calibration
 - Performing 1-port calibration
 - Performing 2-port calibration
-

Understanding calibration

Calibration of your instrument to the Open, Short, and Load standards is important to get reliable and accurate measurement results. After setting frequencies and right before making a measurement, you need to perform an O-S-L calibration using a mechanical or electronic calibration kit

Calibration tools

You need to have the following calibration tools to be able to perform a calibration. This instrument detects the connected calibration kit and displays a different on-screen instruction for it.

- Mechanical Y-Cal kit or electronic EZ-Cal kit
Note. In case of calibration with Ez-Cal, there is no Cal Off (T)
 - Extension cable(s) if necessary
-

Performing 1-port Calibration

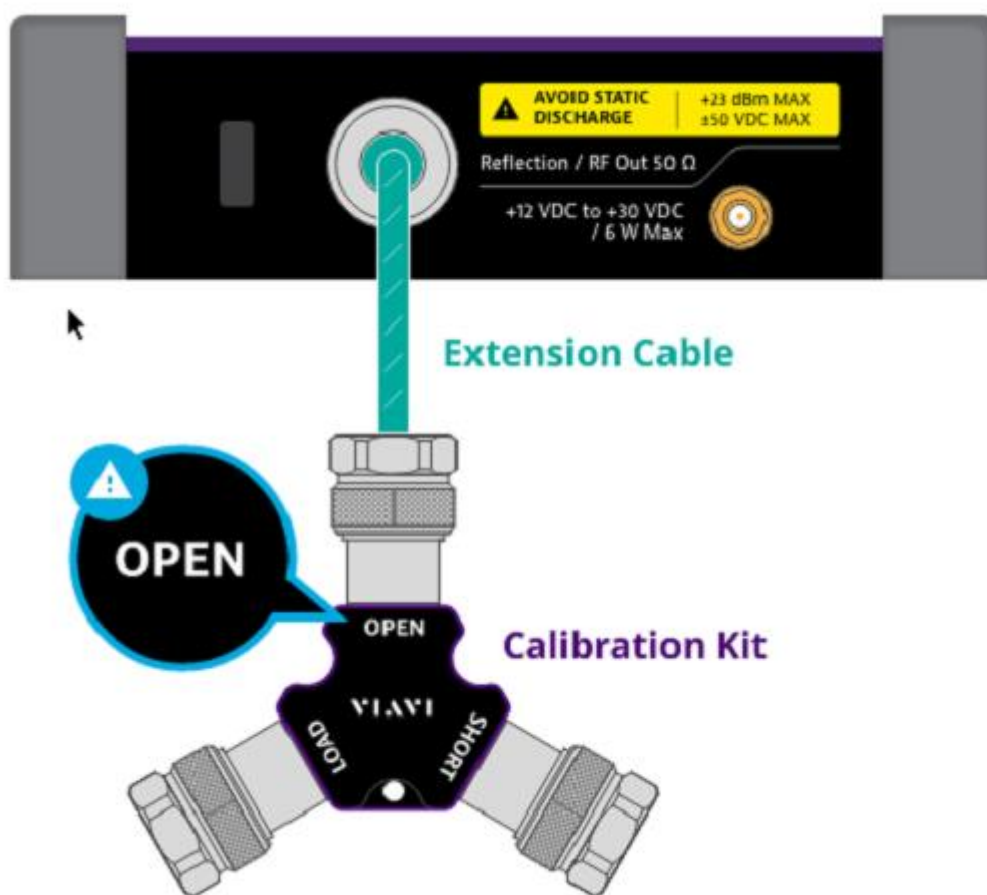
Measurement modes that need the 1-port calibration are Reflection, DTF, 1 Port Cable Loss, 1 Port Phase and Smith Chart.

It is recommended that you perform an O-S-L calibration right at the RF Out / Reflection port of the instrument without using an extension cable in order to minimize a measurement error. If using an extension cable is inevitable, you need to use a phase stable cable and perform the O-S-L calibration at the end of the extension cable.

O-S-L calibration using mechanical Y-Cal kit

Procedure

1. Connect an extension cable, if necessary, to the **Reflection / RF Out** port of the instrument.
2. Tap **Cal** icon in the right side bar. The on-screen instruction appears to guide you through the mechanical O-S-L calibration.
3. Connect the **OPEN** standard of the calibration kit to the instrument's **Reflection / RF Out** port or to the extension cable if used.
4. Tap the **O-S-L** button. The calibration progress bar appears.
5. Disconnect the calibration kit and then connect the **SHORT** standard of the calibration kit to the instrument's the **Reflection / RF Out** port or to the extension cable if used.
6. Tap the **Continue** button. The calibration progress bar appears.
7. Disconnect the calibration kit and then connect the **LOAD** (50 Ω) standard of the calibration kit to the instrument's the **Reflection / RF Out** port or to the extension cable if used.
8. Tap the **Continue** button. The calibration progress bar appears.
9. Check the screen to see if the calibration status is now changed to **Cal ON**.



O-S-L calibration using electronic EZ-Cal kit

The e-Calibration is an Open-Short-Load calibration using the electronic EZ-Cal kit, which allows you to perform the O-S-L calibration easy and fast with only one connection of the kit to the instrument.

Procedure

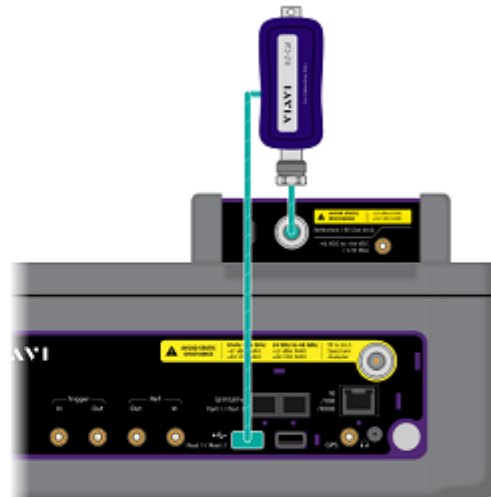
1. Connect an extension cable, if necessary, to the **Reflection / RF Out** port of the instrument.
2. Connect the **EZ-Cal** to the instrument's **Reflection / RF Out** port or to the extension cable if used.
3. Connect the USB cable to the side of the **EZ-Cal** and then to the **USB Host** port to power the e-calibration kit.
4. Tap **Cal** icon in the right side bar. The on-screen instruction appears to guide you through the e-calibration.
5. Tap the **Continue** button. The calibration progress bar appears.

6. Check the screen to see if the calibration status is now changed to **Cal ON**.
7. After the electronic calibration has been completed, the EZ-Cal kit changes its status back to Open.
7. Make sure to disconnect the EZ-Cal kit including its USB connection.

Instrument Configuration

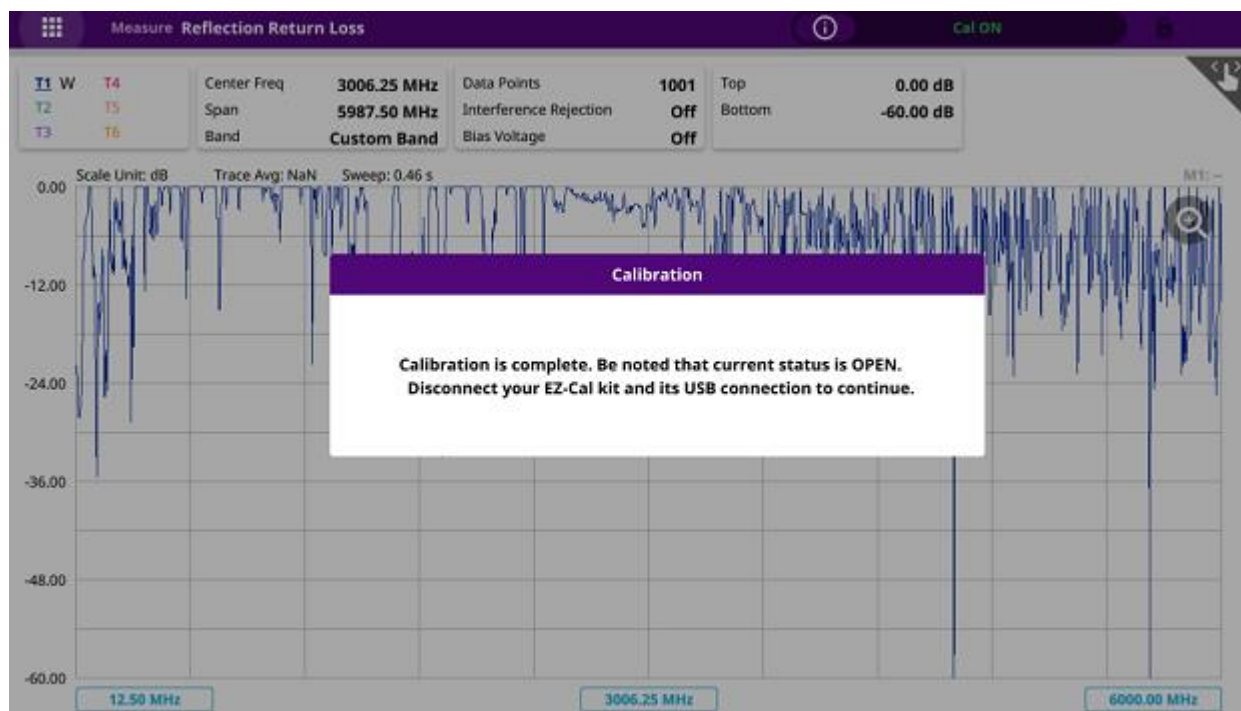
01 Check the connection as illustrated.

02 Press the O-S-L button to start calibration.
A progress bar is displayed to show the calibration progress in percentage.



O-S-L

Cancel



Quick calibration

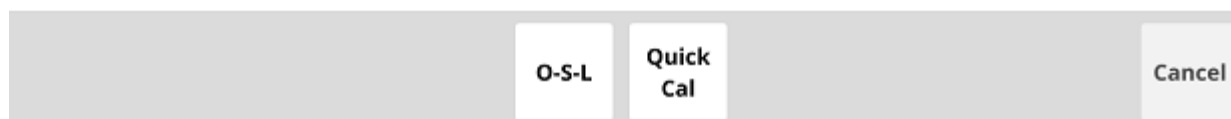
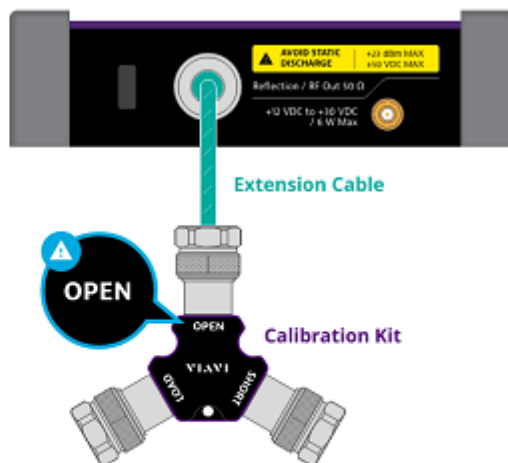
The Quick calibration that is available only in the DTF measurement mode is useful when you want to measure the cable length only, without having to perform a full calibration. It's only valid only for a DTF measurement in the single layout. If you change the display mode to others, calibration status goes back to the previous one.

Procedure

1. Connect an extension cable, if necessary, to the **Reflection / RF Out** port of the instrument.
2. Tap **Cal** icon in the right side bar. The on-screen instruction appears containing the **Quick Cal** button.
3. Connect the **OPEN** standard of the calibration kit to the instrument's the **Reflection / RF Out** port or to the extension cable if used.
4. Tap the **Quick Cal** button. The calibration progress bar appears.
5. Check the screen to see if the calibration status is now changed to **Cal ON (Q)**.

Instrument Configuration

- 01 Connect the Open connector of the CAL kit to the RF Out/Reflection port or the other end of an extension cable as illustrated.
- 02 Press the O-S-L or Quick Cal button to start calibration. A progress bar is displayed to show the calibration progress in percentage.



Performing 2-port Calibration

For 2 Port Transmission measurement mode that needs the 2-port calibration, you must perform the mechanical or electronic O-S-L calibration and then the Thru calibration after setting the frequency and the output power.

Below figure illustrates a connection setup for Thru calibration only. Prior to this Thru calibration, you must perform O-S-L calibration as described in the previous pages.

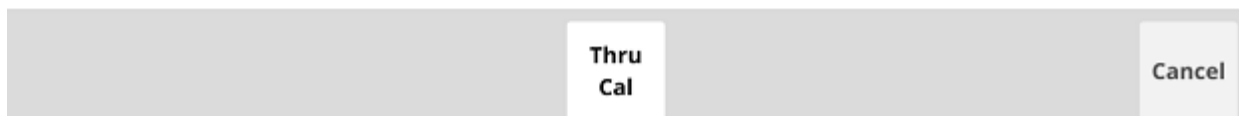
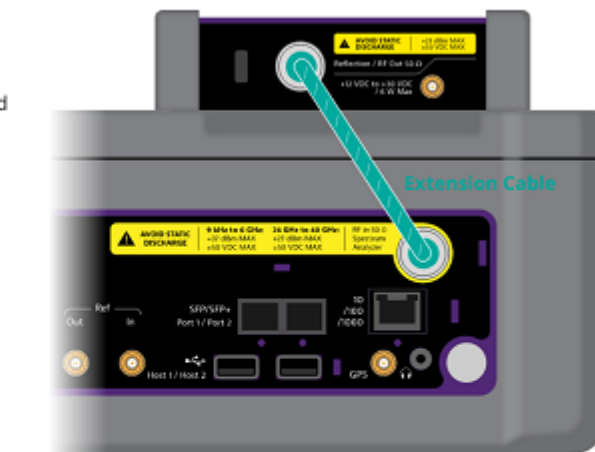
Thru calibration

Procedure

1. Connect the test cable to the **Reflection / RF Out** port and **RF In** port of the instrument.
2. Tap **Thru Cal** to start calibration. A progress bar is displayed to show the calibration progress in percentage.
3. Check the screen to see if the calibration status is now changed to **Cal ON**.

Instrument Configuration

- 01 Connect the test port cables between the RF Out/Reference and RF In as illustrated.
- 02 Press the Thru Cal button to start calibration.
A progress bar is displayed to show the calibration progress in percentage.



Reflection Test

Introduction

This chapter provides instructions on how to perform Reflection measurements in VSWR or Return Loss. Topics discussed in this chapter are as follows:

- Introducing reflection measurements
 - Preparing for a measurement
 - Making a measurement
-

Introducing reflection measurement

Reflection measurements in VSWR or Return Loss are used to characterize cable and antenna system in order to ensure a cell site's impedance matching and signal reflection characteristics.

A proper RF emission in cell sites is achieved with a maximum power transfer from the transmitter to the antenna, where all the transmission media should have an impedance match. A mismatch at the antenna system produces a reflective 'traveling wave' that goes in the opposite direction from the incident wave. As the two traveling waves cross each other in opposite direction, it produces an interference pattern called a "standing wave". VSWR is the ratio between the power that is sent forward to the cable and/or antenna and the amount of the power that is reflected back to the transmitter.

Some of the consequences of having a high VSWR condition in cellular services are dropped calls, poor reception, and an overall unacceptable performance in the cell (or section of cell) coverage covered by the base station antenna. Therefore, the VSWR of the antenna system including the feed line is one of the most critical factors in the service and maintenance of the RF transmitter systems.

VSWR

In telecommunications, standing wave ratio (SWR) is the ratio of the amplitude of a partial standing wave at its maximum amplitude and at its minimum, in an electrical transmission line. The SWR is usually defined as a voltage ratio called the VSWR, for voltage standing wave ratio. 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.

Return loss

In telecommunications, return loss is a measure of power reflected from imperfections in an electrical or optical communication link. The ratio (PR / PT), represents the wave power reflected from the imperfection (PR) to that of the incident, or transmitted, wave, (PT). For maximum transmitted power, the return loss should be as small as possible, meaning the ratio PR / PT should be as small as possible.

Return loss is usually expressed in dB and the return loss value describes the reduction in the amplitude of the reflected energy, as compared to the forward energy. It will always be a loss and therefore a negative dB. However, you can write -3 dB simply as 3 dB of loss, dropping the negative sign and adding loss. For example, if a device has 15 dB of return loss, the reflected energy from that device (PR), is always 15 dB lower than the transmitted energy (PT). When expressed in dB, larger (in magnitude) negative numbers represent larger return losses and thus smaller reflected power (PR).

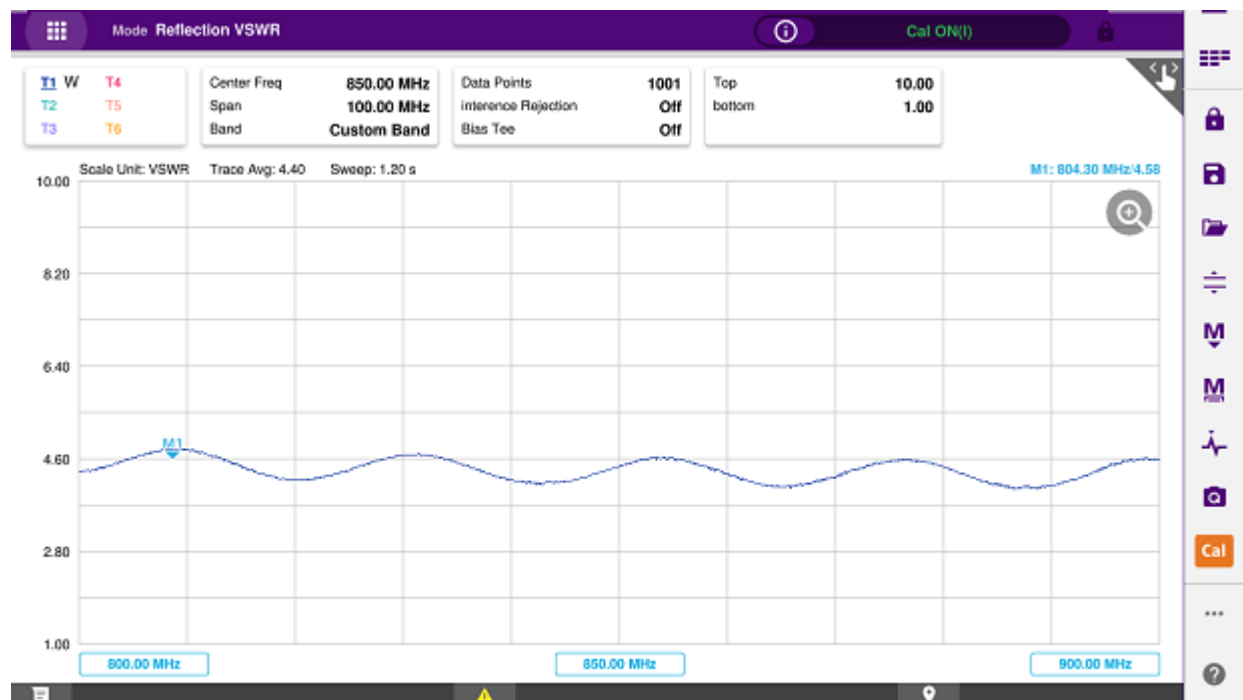
In electrical systems, return losses often occur at junctions between transmission lines and terminating impedances. It is a measure of the dissimilarity between impedances in metallic transmission lines and loads. For devices that are not perfect transmission lines or purely resistive loads, the return loss value varies with the frequency of the transmitted signal.



NOTE:

You can also view reflection measurements in Smith Chart to help you graphically identify problems with transmission lines.

Reflection measurement screen



Preparing for a measurement

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **Reflection VSWR** () or **Reflection Return Loss** () icon as needed.




NOTE:

You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

- 1 Tap the **Menu** () key on the side bar and tap **Frequency**.
- 2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.
- 3 To select a band, tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer. Tap your choice from the list and tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.




NOTE:



Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can


also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.


- 1 Tap the **Menu** () key on the side bar and tap **Amplitude**.
- 2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.
- 3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for the **Reflection** mode is **1 to 65 in VSWR** and **-60 to 0 dB in Return Loss**.

	<p>NOTE:</p> <p>You can also tap AUTO SCALE() any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace.</p>
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General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

- 1 Tap the **Menu** () key on the side bar and tap **General**.
- 2 To set the measurement resolution, select the **Data Points** option from the choices: **126, 251, 501, 1001** and **2001**.

	<p>NOTE:</p> <p>Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.</p> <p>The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.</p>
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- 3 To enable the **Interference Rejection** feature, select **On**.

	<p>NOTE:</p> <p>Default setting is Off. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.</p>
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- 4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

**NOTE:**

If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Performing calibration

Perform the mechanical or electronic O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a reflection measurement in VSWR or Return Loss.

Procedure

- 1 Disconnect the calibration kit from the calibration point.
- 2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.
- 3 Your measurement result is displayed on the screen in real time.

**CAUTION**

Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.

**NOTE**

Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

**WARNING**

Do not attempt to connect the instrument to the antenna when there is a risk of

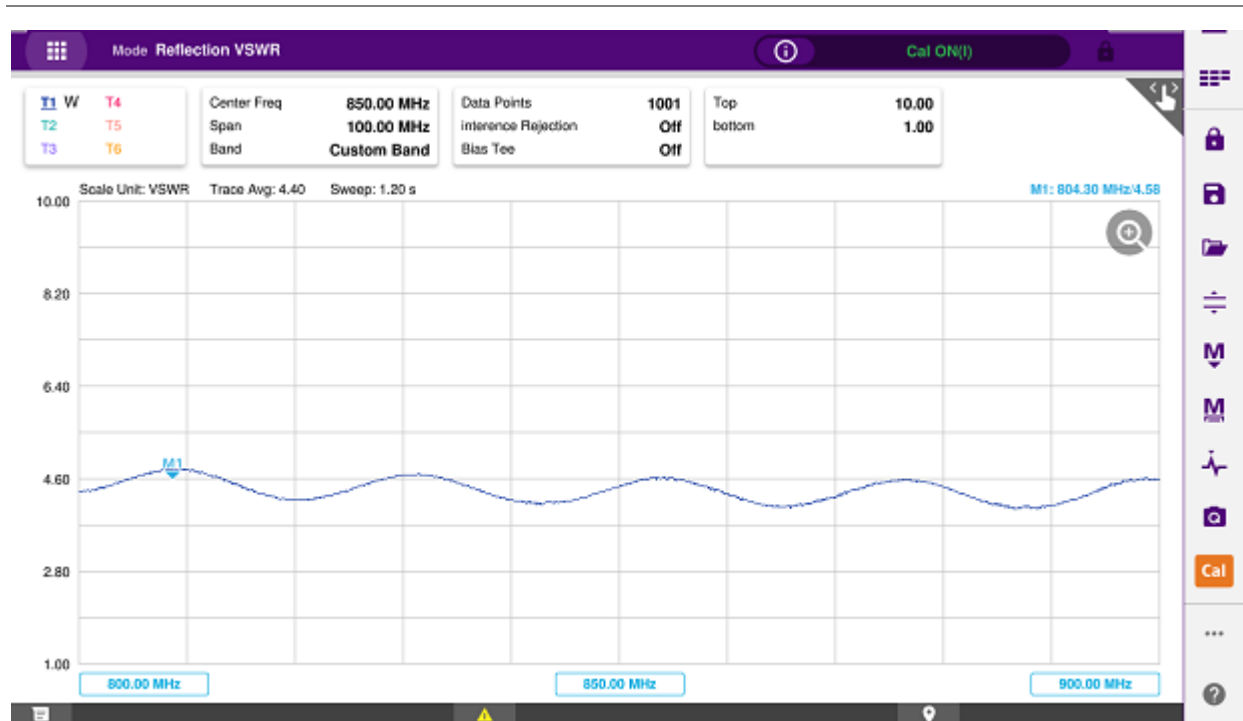
lightning. Electric shock may cause malfunction of or damage to the instrument.

- 4 Tap **Channel Number** and input a value using the on-screen keyboard.
- 5 Tap the **Continue** button on the right edge to continue.
- 6 Set the parameters appeared on the table below the chart screen as needed.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

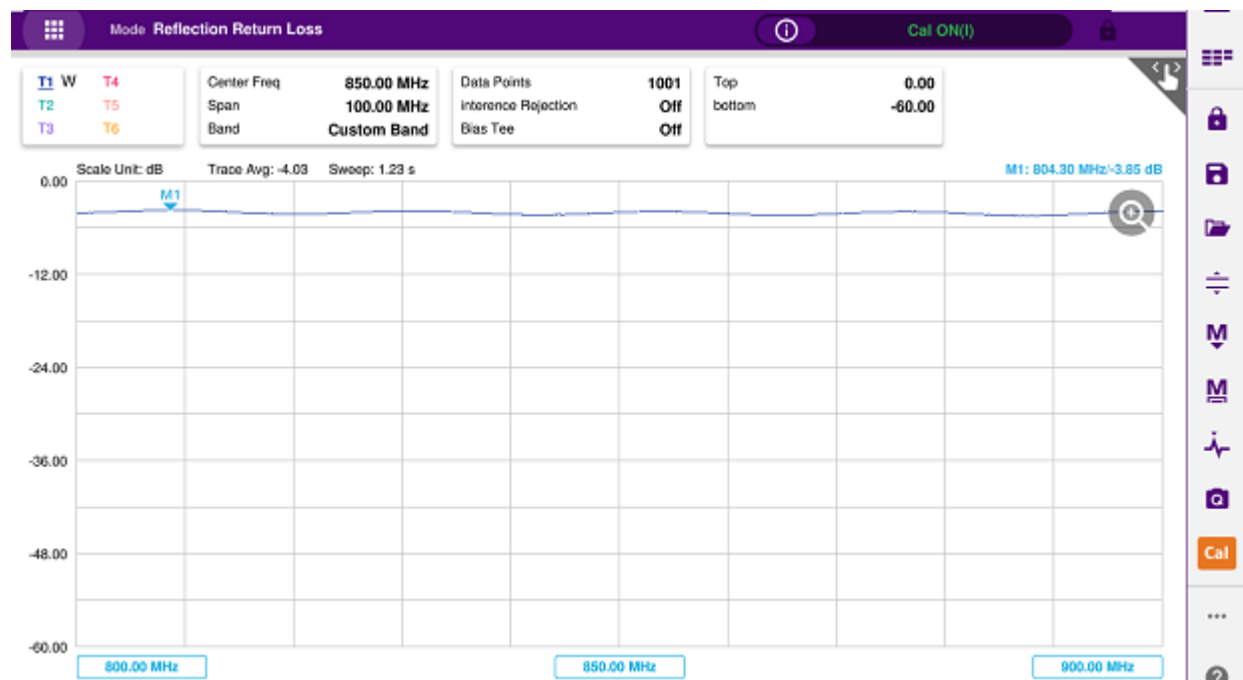
Reflection VSWR measurement screen (single layout)



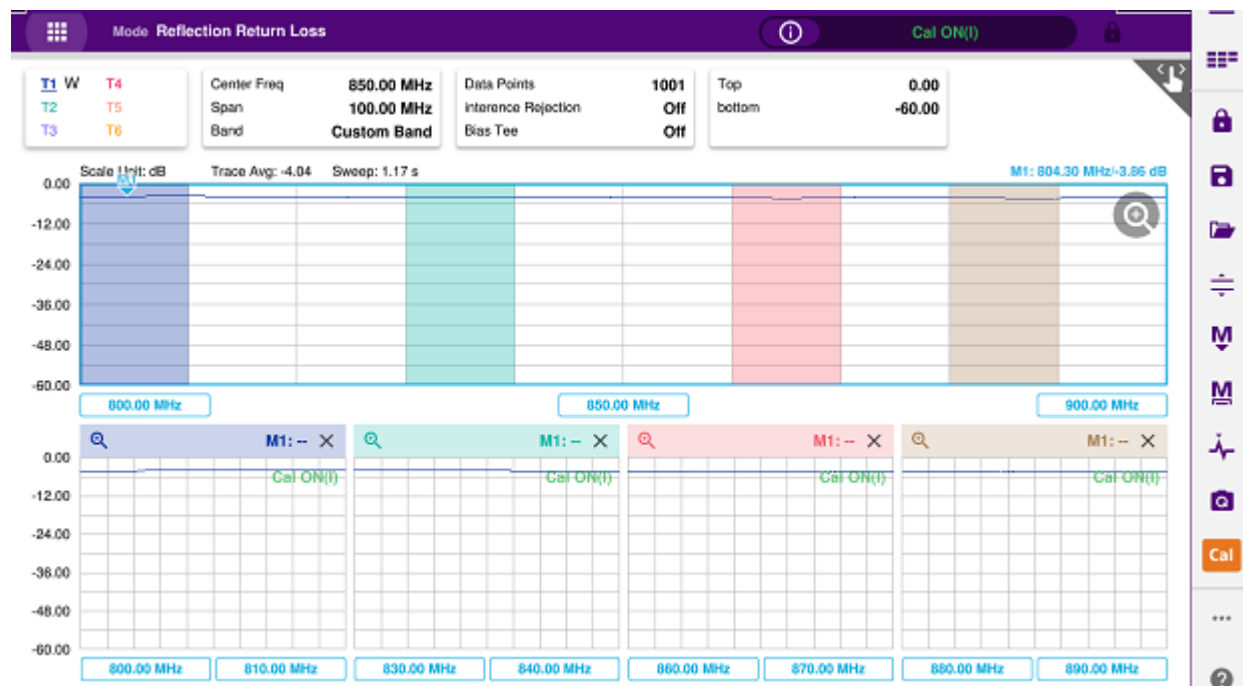
Reflection VSWR measurement screen (zoom zones)



Reflection return loss measurement screen (single layout)



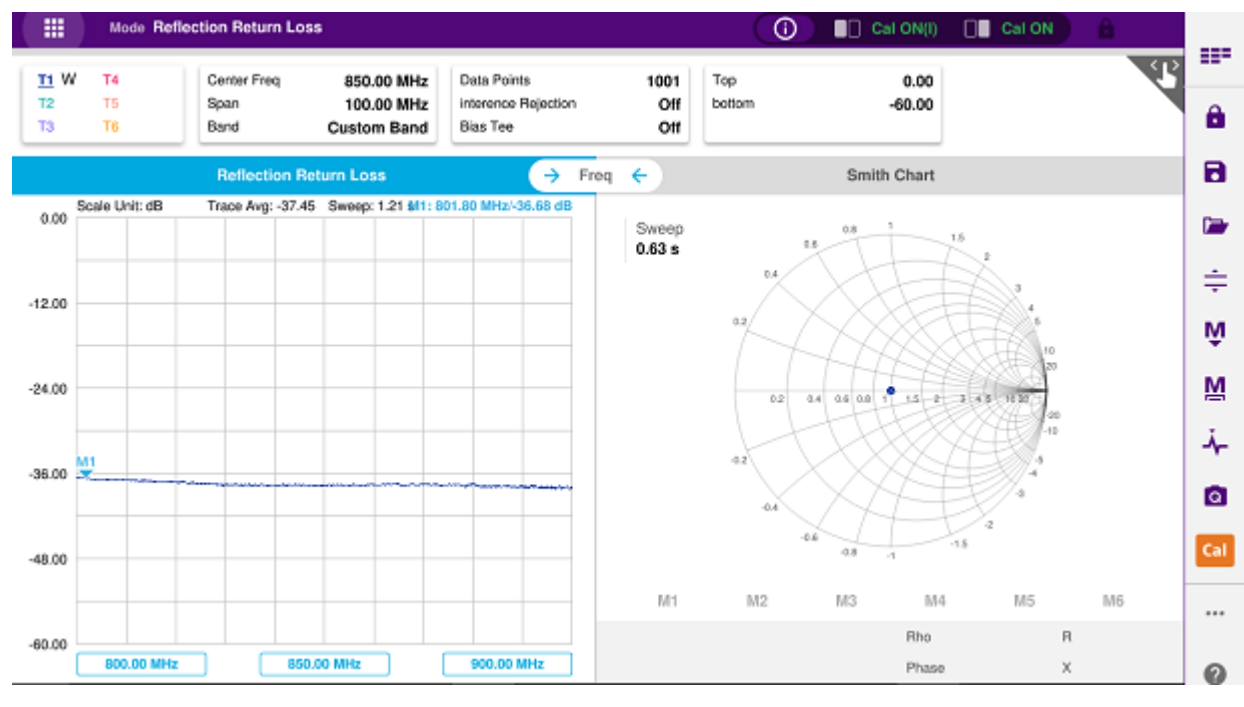
Reflection return loss measurement screen (zoom zones)



Reflection VSWR & DTF return loss measurement screen (horizontal layout)



Reflection return loss & smith chart measurement screen (vertical layout)



DTF Testing

Introduction

This chapter provides instructions on how to perform DTF (Distance to Fault) measurements in VSWR or Return Loss. Topics discussed in this chapter are as follows:

- Introducing DTF measurements
 - Preparing for a measurement
 - Making a measurement
-

Introducing DTF measurements

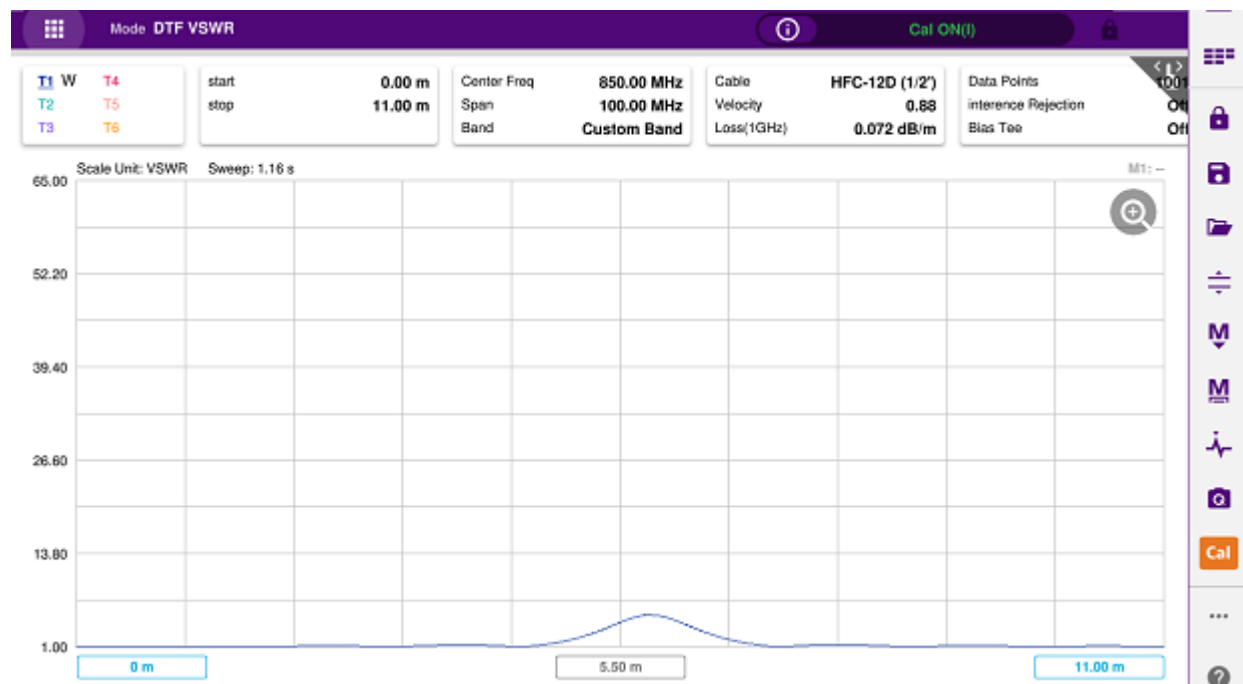
While VSWR is an indicator to express the efficiency of the cell site's energy transmission, DTF is a measurement to identify the fault locations in the antenna line system. Most of the antenna line system consists of various types of coaxial cables, connectors, and devices such as dividers and surge arrestors.

Since VSWR is a measurement to verify the impedance discontinuity of the total feed line system, it is necessary to perform DTF measurement to identify the exact component that is contributing to the performance degradation of the line system. The DTF measurement makes it easy to identify the fault location by displaying the relative distance of the signal reflections or discontinuities from various points of the transmission system.

In DTF measurements, 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 whilst lower impedance creates a reflection that opposes the original signal. The resulting reflected signal that is measured at the output/input to the instrument is displayed or plotted as a function of time and, because the speed of signal propagation is relatively constant for a given transmission medium, it can be read as a function of cable length or distance location. Because of this sensitivity to impedance variations, the instrument may be used to verify cable impedance characteristics, splice and connector locations and associated losses, and estimate cable lengths or faulty location.

DTF measurement screen



Preparing for a measurement

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **DTF VSWR** () or **DTF Return Loss** () icon as needed.



NOTE:


You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It

is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

- 1 Tap the **Menu** () key on the side bar and tap **Frequency**.
- 2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.
- 3 To select a band tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer. Tap your choice from the list and tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.




NOTE:

Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.


Distance



You can also manually set a distance to be measured by entering start and stop distances. The maximum measurable distance is dependent on the frequency you set. You can set any values within the maximum measurable distance, but optimum resolution is achieved when you set the distance same as the maximum measurable distance, which is displayed in the measurement setting information bar at the bottom of the measurement screen.

- 1 Tap the **Menu** () key on the side bar and tap **Distance**.
- 2 Input the values of **Start Distance**, **Stop Distance** using the on-screen keyboard and tap **Apply**.

Amplitude


You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.


- 1 Tap the **Menu** () key on the side bar and tap **Amplitude**.
- 2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.
- 3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for the **DTF** mode is **1 to 65 in VSWR** and **-60 to 0 dB in Return Loss**.

	<p>NOTE:</p> <p>You can also tap Auto Scale () any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace.</p>
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General parameters

You can select options for Data Points, Interference Rejection, Windowing, Distance unit and Bias Tee.


- 1 Tap the **Menu** () key on the side bar and tap **General**.
- 2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.

	<p>NOTE:</p> <p>Default setting is 1001. The larger number you choose, the lower resolution you get even though you can have longer Max Distance to measure. Changing data points does not affect calibration status.</p>
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- 3 To enable the **Interference Rejection** feature, select **On**.

	<p>NOTE:</p> <p>Default setting is Off. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.</p>
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- 4 To set the method of video filtering to display the trace, select the **Windowing** option from the following choices: **Rectangular**, **Blackman**, **Nominal Side**, **Low Side** and **Minimum Side**.


	<p>NOTE:</p> <p>If the video filtering is activated by selecting a different type of Windowing filters, Rectangular or Blackman, the overshoots of the trace are reduced by smoothing out the sharp transitions so that you can easily discriminate noises and peaks. For example, if you select the Blackman, noises around peaks are reduced and it helps you verify a DTF location clearly.</p>
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- 5 To change the display unit for distance, select the **Unit** option from the choices: **Meter** and **Foot**.

	<p>NOTE:</p> <p>Setting your city and time zone automatically changes not only the date and time but also</p>
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	the distance unit in the DTF settings accordingly to Meter or Foot.
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6 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

	<p>NOTE:</p> <p>If you have set this Bias Voltage to On, the instrument will supply a DC bias of set level (12 – 30 V) from the SMA port to an external bias-tee device.</p>
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Cable Definition

You can select a cable from the list of cable names stored in the instrument or define a cable as custom cable by setting the propagation velocity and cable loss parameters.

- 1 Tap the **Menu** () key on the side bar and tap **Cable Definition**.
- 2 Tap **Cable Name** and The Cable List window appears, displaying standard cables stored in the instrument and custom cables created in the JDViewer.
- 3 Select a cable to choose from the list and then tap **Apply** on the Cable List window. The instrument automatically changes the **Propagation Velocity** and **Cable Loss** values correspondent to the selected cable's propagation velocity and cable loss. Default setting is **HFC-12D (1/2")**.
- 4 If you want to define a new cable, select the **Propagation Velocity** field, and then enter the propagation velocity of the cable using the on-screen keyboard and tap **Apply**.

	<p>NOTE:</p> <p>You can set this relative propagation delay of the cable to be defined. It affects the calculation of distance in DTF measurements.</p>
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5 After entering Propagation velocity, tap **Cable Loss** and enter the cable loss value of the cable using the on-screen keyboard and tap **Apply**. The text "Custom Cable" appears in the **Cable Name** field.

	<p>NOTE:</p> <p>You can set this cable loss of the cable, for which you like to define. It affects the peak level of discontinuity in DTF measurements. If you select a cable from the list, the cable loss value is displayed as "@ 1 GHz". If you define a cable manually, its value is displayed as "@ Custom Frequency".</p>
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Performing calibration

Perform the mechanical or electronic O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L or Quick calibration is done, the instrument is now ready to make a DTF measurement in VSWR or Return Loss. If you like to not only measure the DTF cable length but also get highly accurate and reliable data, you need to perform a full O-S-L calibration.

Procedure

- 1 Disconnect the calibration kit from the calibration point.
- 2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.
- 3 Your measurement result is displayed on the screen in real time.



CAUTION

Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.



NOTE

If O-S-L or Quick calibration has been done at the end of the port extension cable for DTF measurement, the length of the port extension cable is compensated automatically and is not included in the distance to the point of discontinuity.

Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.



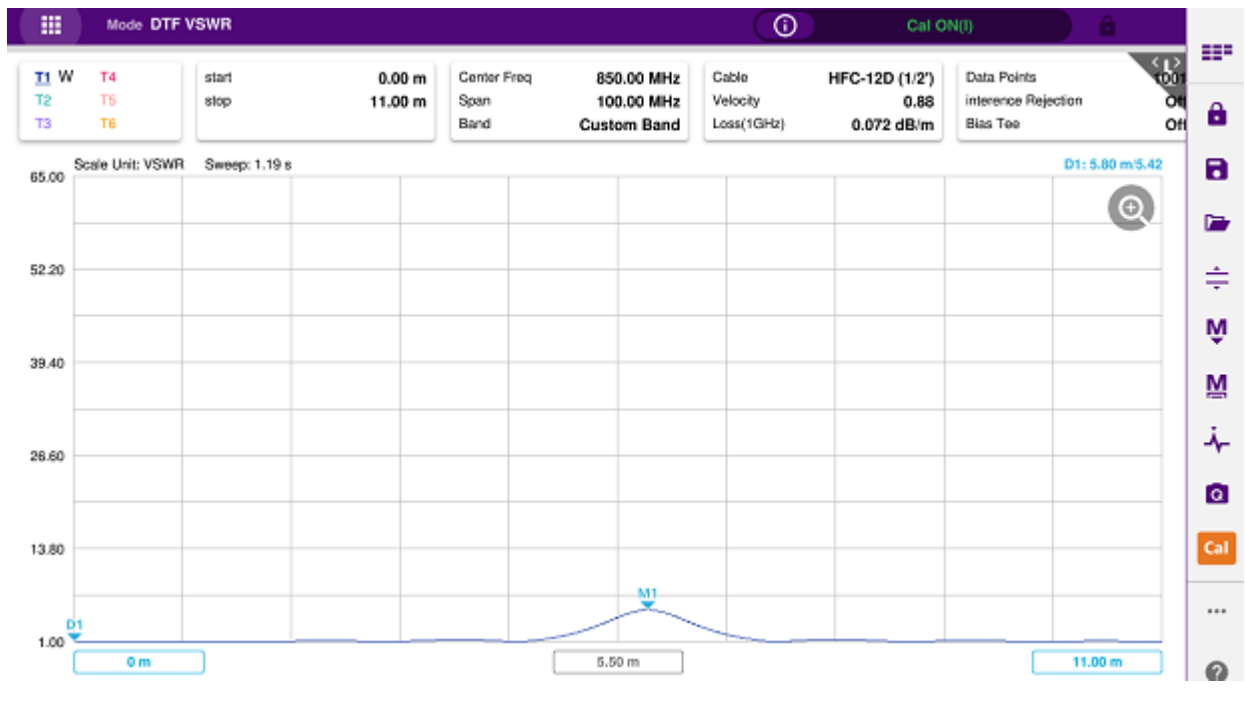
WARNING

Do not attempt to connect the instrument to the antenna when there is a risk of lightning. Electric shock may cause malfunction of or damage to the instrument.

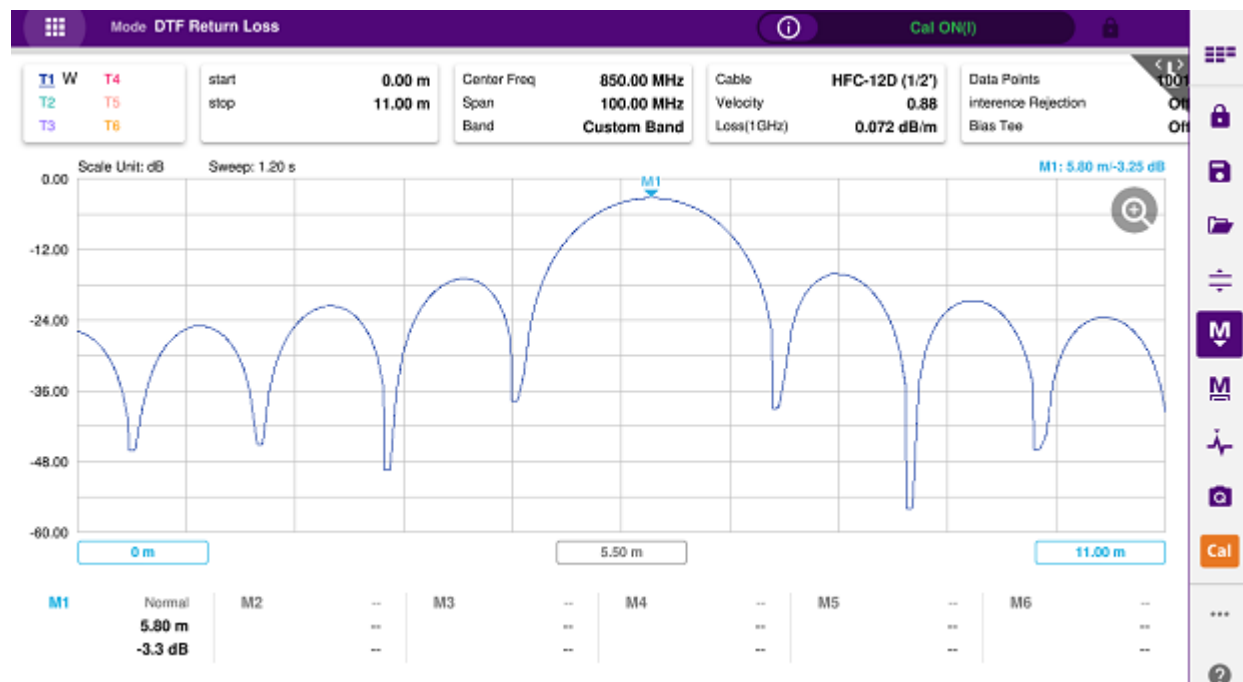
Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

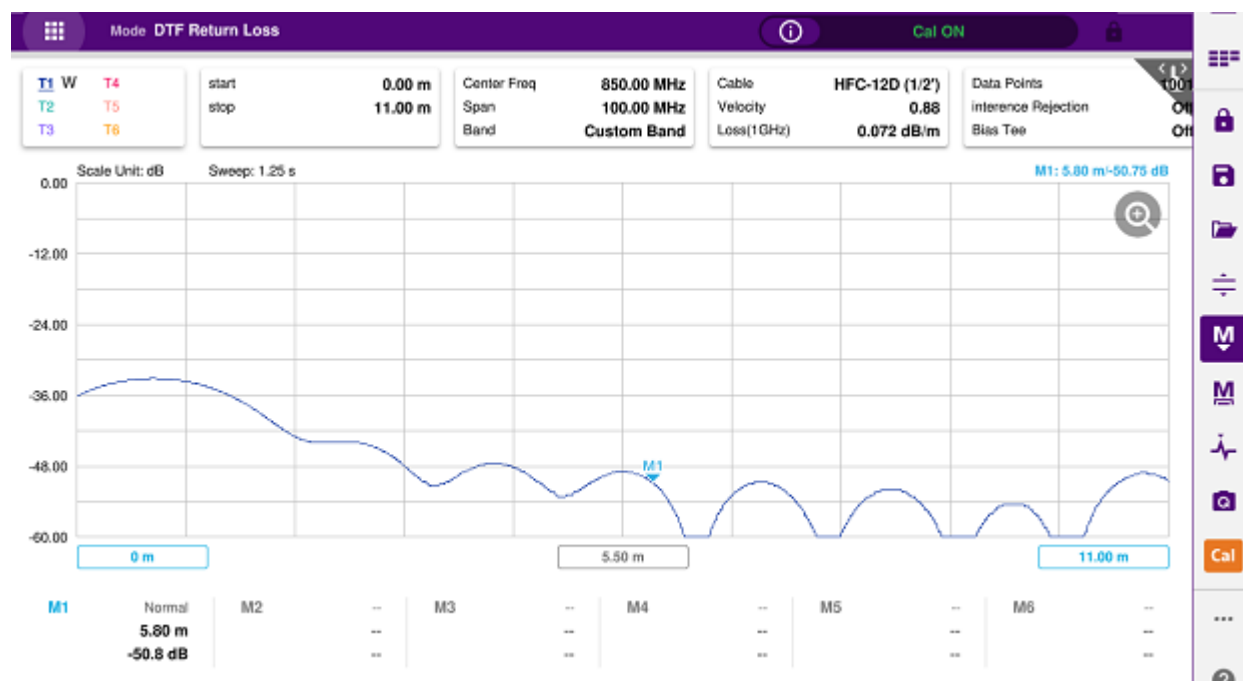
DTF VSWR measurement screen (single layout)



DTF return loss measurement screen (single layout)



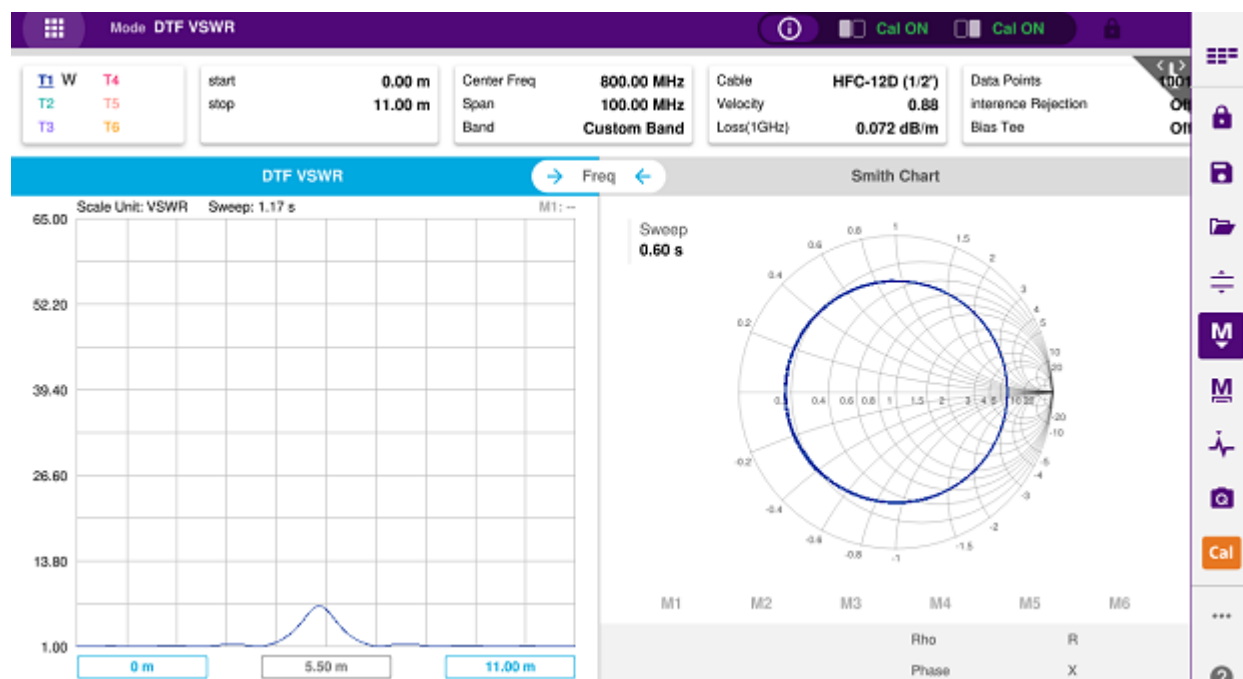
DTF return loss measurement screen (Alt DTF Band on)



Reflection VSWR & DTF return loss measurement screen (horizontal layout)



DTF VSWR & Smith chart measurement screen (vertical layout)



1-Port Cable Loss Testing

Introduction

This chapter provides instructions on how to perform 1 Port Cable Loss measurements that are used to quantify signal loss in a cable or other device without connecting both ends of the cable or device to the instrument. Topics discussed in this chapter are as follows:

- Introducing 1-port cable loss measurements
 - Preparing for a measurement
 - Making a measurement
-

Introducing 1-port cable loss measurements


The 1 Port Cable Loss measurement checks the signal attenuation level of the cable. The frequency band to measure the characteristics of a cable must be calibrated before performing the cable loss measurement. 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.


1 port cable loss measurement screen



Preparing for measurement

Selecting measurement mode

- 1 Tap **Single** under the **Mode & Measure**.
- 2 Double-tap the **1 Port Cable Loss** () icon.




NOTE:

You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.


- 1 Tap the **Menu** () key on the side bar and tap **Frequency**.
- 2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.
- 3 To select a band tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer. Tap your choice from the list and tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

**NOTE:**


Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.


- 1 Tap the **Menu** () key on the side bar and tap **Amplitude**.
- 2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.
- 3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for this measurement mode is **0 to 30 dB**.

**NOTE:**


You can also tap **Auto Scale** () any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace and the limit..

General parameters


You can select options for Data Points, Interference Rejection, and Bias Tee.

- 1 Tap the **Menu** () key on the side bar and tap **General**.


- 2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.

	<p>NOTE:</p> <p>Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.</p> <p>The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.</p>
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- 3 To enable the **Interference Rejection** feature, select **On**.

	<p>NOTE:</p> <p>Default setting is Off. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.</p>
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- 4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

	<p>NOTE:</p> <p>If you have set this Bias Voltage to On, the instrument will supply a DC bias of set level (12 – 30 V) from the SMA port to an external bias-tee device.</p>
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Performing calibration

Perform the O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a cable loss measurement.

Procedure

- 1 Disconnect the calibration kit from the calibration point.
- 2 Connect the calibration kit's SHORT standard.

3 Your measurement result is displayed on the screen in real time.



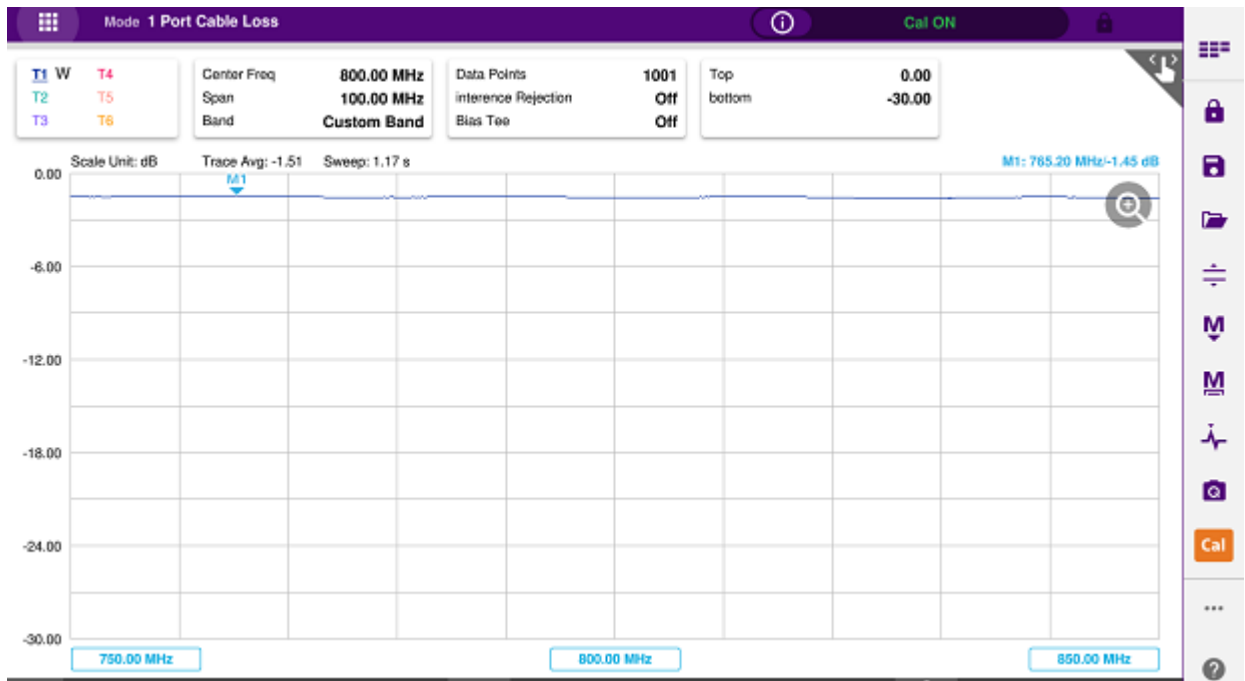
NOTE

Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

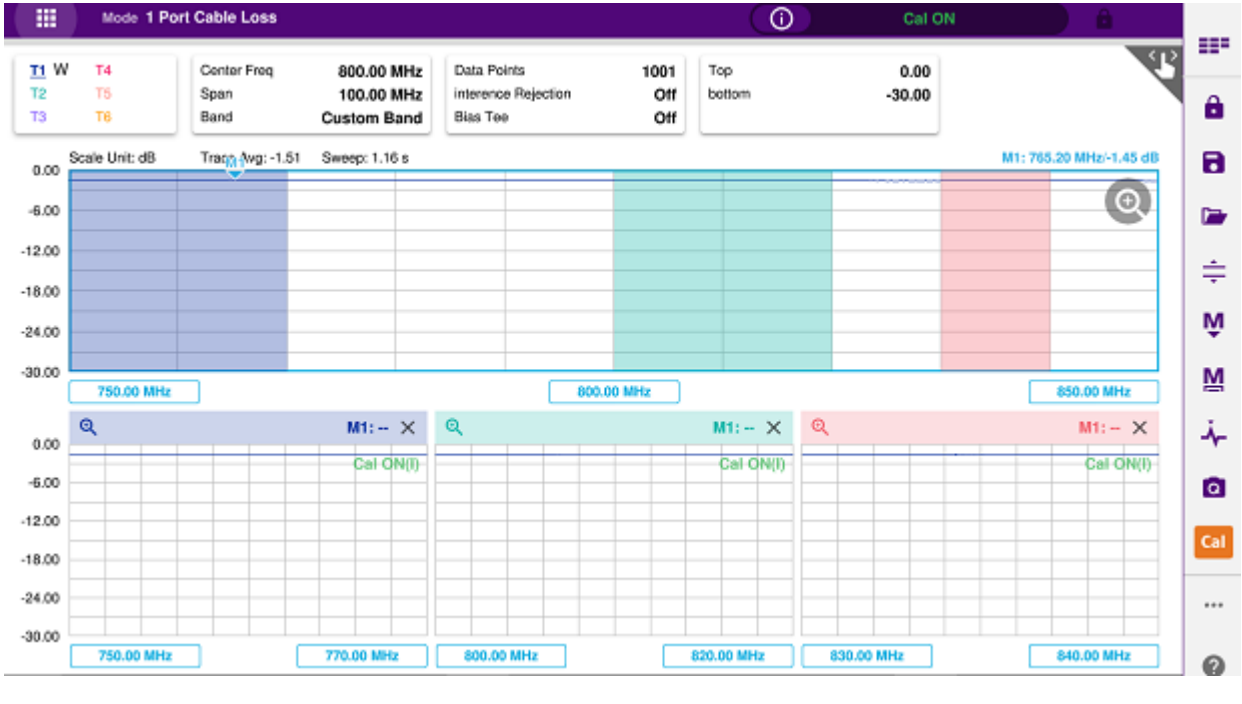
Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

1 port cable loss measurement screen (single layout)



1 port cable loss measurement screen (zoom zones)



1-Port Phase Testing

Introduction

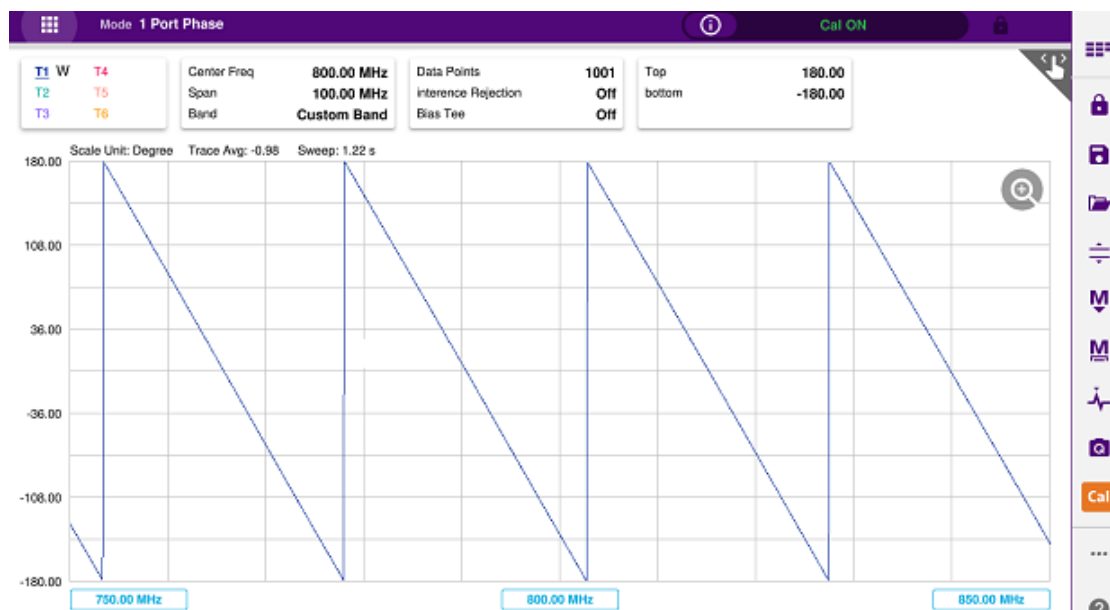
This chapter provides instructions on how to perform 1 Port Phase measurements to tune DUT's impedance matching and phase match cables. Topics discussed in this chapter are as follows:

- Introducing 1-port phase measurements
- Preparing for a measurement
- Making a measurement

Introducing 1-port phase measurements

You can use 1 Port Phase mode to measure S11 phase when you want to tune antennas and phase match cables.

1 port phase measurement screen



Preparing for a measurement

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **1 Port Phase** () icon.




NOTE:

You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

- 1 Tap the **Menu** () key on the side bar and tap **Frequency**.
- 2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.
- 3 To select a band tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer. Tap your choice from the list and tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.






NOTE:

Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

Amplitude


You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.


- 1 Tap the **Menu** () key on the side bar and tap **Amplitude**.
- 2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.
- 3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for this measurement mode is **-180 to 180 Degree**.

	<p>NOTE:</p> <p>You can also tap Auto Scale() any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace.</p>
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General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

- 1 Tap the **Menu** () key on the side bar and tap **General**.
- 2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.

	<p>NOTE:</p> <p>Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.</p> <p>The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.</p>
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- 3 To enable the **Interference Rejection** feature, select **On**.

	<p>NOTE:</p> <p>Default setting is Off. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.</p>
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- 4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

**NOTE:**

If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Performing calibration

Perform the O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a cable loss measurement.

Procedure

- 1 Disconnect the calibration kit from the calibration point.
- 2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.
- 3 Your measurement result is displayed on the screen in real time.

**CAUTION**

Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.

**NOTE**

Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

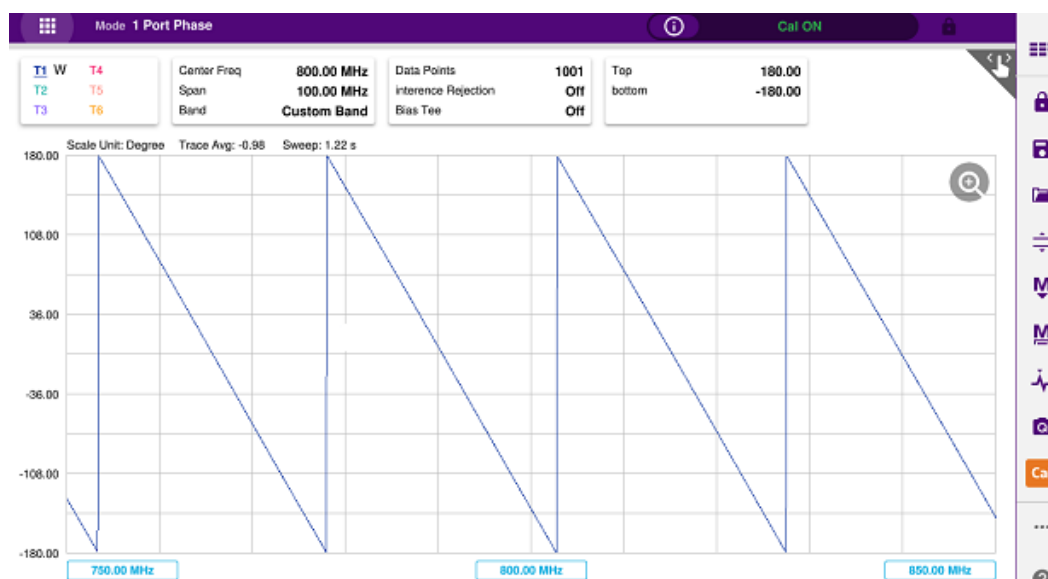
**WARNING**

Do not attempt to connect the instrument to the antenna when there is a risk of lightning. Electric shock may cause malfunction of or damage to the instrument.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

1 port phase measurement screen (single layout)



Smith Chart Testing

Introduction

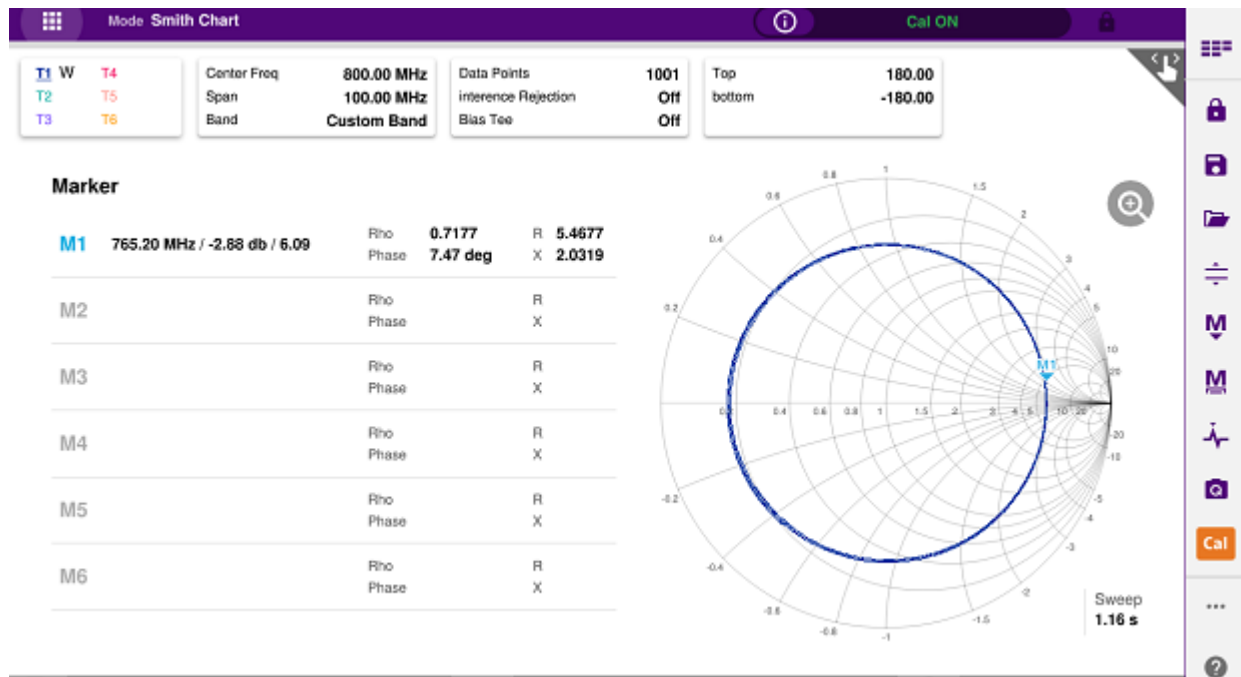
This chapter provides instructions on how to perform reflection measurements in Smith Chart. Topics discussed in this chapter are as follows:

- Introducing Smith chart measurements
 - Preparing for a measurement
 - Making a measurement
-

Introducing Smith chart measurements

You can view reflection measurements in Smith Chart, which is used to display impedance matching characteristics in the cable and antenna system as well as filter and duplexers devices. It helps you graphically identify problems with transmission lines.

Smith chart measurement screen



Preparing for a measurement

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **Smith Chart** () icon.




NOTE:

You can choose two measurement mode from the **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.


- 1 Tap the **Menu** () key on the side bar and tap **Frequency**.
- 2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.
- 3 To select a band tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer. Tap your choice from the list and tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.

**NOTE:**

Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.

General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

- 1 Tap the **Menu** () key on the side bar and tap **General**.
- 2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.

**NOTE:**

Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.

The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.

- 3 To enable the **Interference Rejection** feature, select **On**.

**NOTE:**

Default setting is **Off**. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.

- 4 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

**NOTE:**

If you have set this **Bias Voltage** to **On**, the instrument will supply a DC bias of set level (12 – 30 V) from the **SMA** port to an external bias-tee device.

Performing calibration

Perform the O-S-L Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a cable loss measurement.

Procedure

- 1 Disconnect the calibration kit from the calibration point.
- 2 Connect an antenna or feed line to the calibration point, which is usually at the extension cable end if used.
- 3 Your measurement result is displayed on the screen in real time.

**CAUTION**

Do not apply or connect power exceeding +30 dBm to the **Reflection / RF Out** port. When the input signal power is greater than +30 dBm, it may cause a damage to the CAA module and instrument.

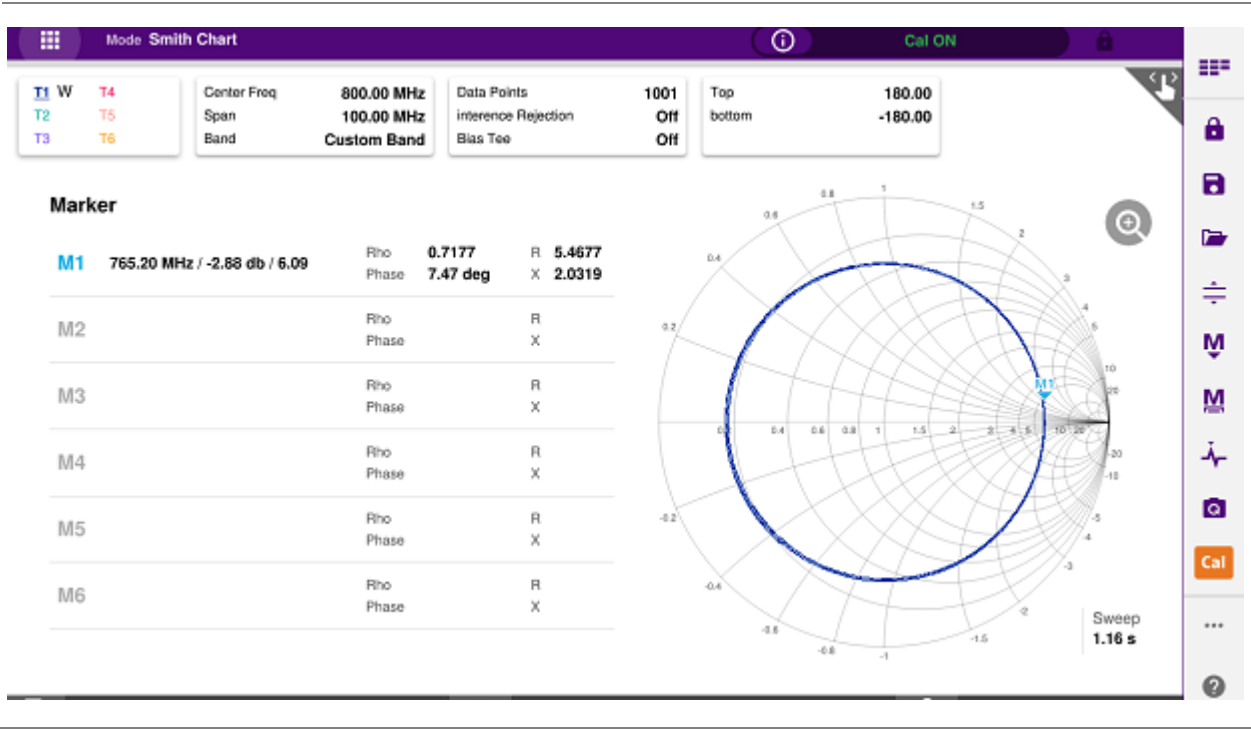
**NOTE**

Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

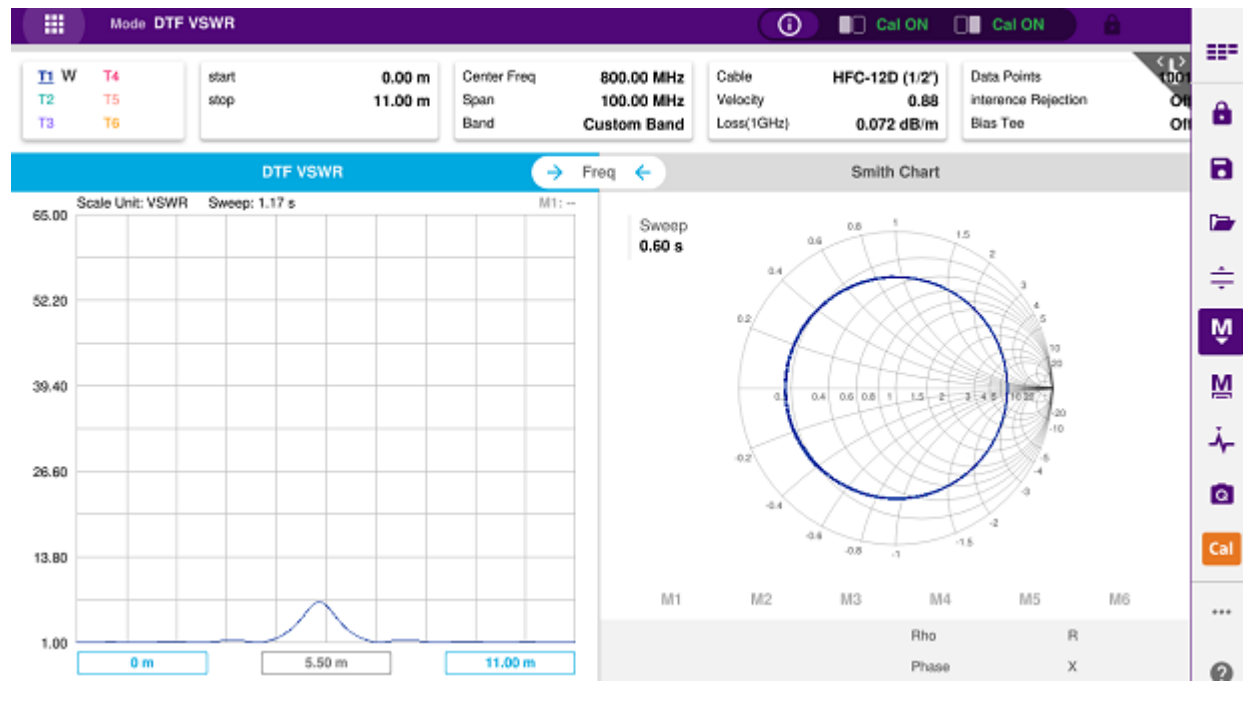
Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

Smith chart measurement screen (single layout)



DTF VSWR & Smith chart measurement screen (vertical layout)



2-Port Transmission Testing

Introduction

This chapter provides instructions on how to perform the 2-Port Transmission measurement. It is used to quantify signal gain or loss in a cable or other devices with connecting both ends of the cable or device to the instrument. Topics discussed in this chapter are as follows:

- Introducing 2-port transmission measurements
 - Preparing for a measurement
 - Making a measurement
-

Introducing 2-port transmission measurement

The 2 Port Transmission measures the level of the signal attenuation of passive RF elements such as cables and filters, or the level of gains of active RF elements such as amplifiers. The frequency band to measure the characteristics of a cable must be calibrated before performing the insertion loss/gain measurement.

Gain

The gain is the gain resulting from the insertion of a device in a transmission line, expressed as the ratio of the signal power delivered to that part of the line following the device to the signal power delivered to that same part before insertion.

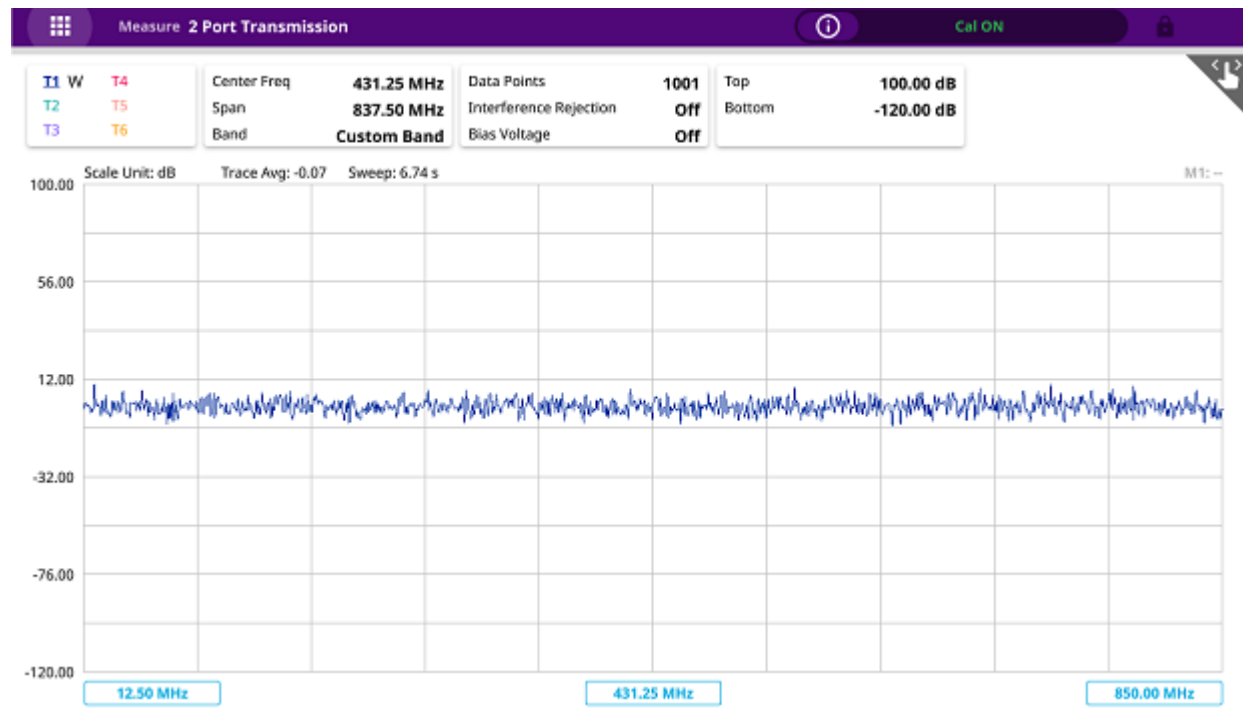
Insertion loss

The insertion loss is the loss of the transmitted signal power resulting from the insertion of a device in a transmission line. It is usually expressed relative to the signal power delivered to that same part before insertion. In most systems, insertion loss is introduced by things such as connectors, splitters, or couplers.

The insertion loss of a device (which may be a whole line) may also be referred to as attenuation. Line terminations play an important part in the insertion loss because they reflect some of the power. Apart from this, it is clear that not all of the power that is sent in to the line at one end appears at the other. This is because of radiation losses, resistive losses in the conductor as well as losses in the surrounding dielectric. The loss resulted from inserting a transmission line between a source and a load is called the insertion loss of the line.


If the power transmitted by the source is P_T and the power received by the load is P_R , then the insertion loss is given by P_R divided by P_T . For maximum power transfer the insertion loss should be as small as possible. In other words, the ratio P_R/P_T should be as close to one as possible, which in decibels means as close to 0 dB as possible.

2 port transmission measurement screen



Preparing for a measurement

Selecting measurement mode

- 1 Tap **Single** under the **Mode & Measure**.
- 2 Double-tap the **2 Port Transmission** () icon.




NOTE:

You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Setting parameters

Frequency

You can manually set a frequency band to be measured by entering start and stop frequencies or center and span frequencies. You can also select a frequency band from the band list stored in the instrument. It is desirable to set the frequency to a value that covers a normal range of the measurement with enough margins.

- 1 Tap the **Menu** () key on the side bar and tap **Frequency**.
- 2 Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard and tap **Apply**.
- 3 To select a band, tap the **Band List** then it displays a list of standard bands stored in the instrument and custom bands created in the JDViewer. Tap your choice from the list and tap the **Apply** button on the Band List box. The instrument automatically updates the values of the **Start Frequency** and **Stop Frequency** according to the selected band.




NOTE:

Frequency changes after calibration affect the calibration status. If changed within the registered bands, the status turns into CAL ON (I) and it does not require re-calibration. If changed off the registered band, the status turns into CAL OFF and it requires re-calibration.


Amplitude

You can set maximum and minimum values of the Y-scale manually by setting the Top and Bottom amplitudes or restore the instrument's default full scale defined for each measurement mode. You can also optimize the Y-scale automatically so that an entire trace can be displayed on the measurement chart. Adjusting Y-scale does not affect calibration status.

- 1 Tap the **Menu** () key on the side bar and tap **Amplitude**.
- 2 Input the values of **Top** and **Bottom** amplitudes using the on-screen keyboard and tap **Apply**. The entered values become the maximum and minimum values for the Y-scale.
- 3 To restore the instrument's default range for the Y-scale, tap **Full Scale**. The amplitude range for this measurement mode is **-120 to 100 dB**.





NOTE:

You can also tap **Auto Scale**() any time you need to view the entire trace on the measurement chart. The instrument automatically optimizes the maximum and minimum values of the Y-scale to display the entire trace and the limit.


General parameters

You can select options for Data Points, Interference Rejection, and Bias Tee.

- 1 Tap the **Menu** () key on the side bar and tap **General**.
- 2 To set the measurement resolution, select the **Data Points** option from the choices: **126**, **251**, **501**, **1001** and **2001**.


	<p>NOTE:</p> <p>Default setting is 1001. It is recommended that you select high resolution data points only for an instance of measuring wide frequency bands or requiring precise measurement data.</p> <p>The larger number you choose, the higher resolution you get and the longer the instrument takes to sweep and display results. For example, selecting 501 data points provides twice as many measurement points as 251, but it may take twice longer to sweep and display the trace than choosing 251 data points. Changing data points does not affect calibration status.</p>
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- 3 You can choose the **Output Power** between **-30 dBm** and **5 dBm** by 1 dB step.


	<p>NOTE:</p> <p>Changing the output power level after calibration affects the calibration status and it requires you to perform a new calibration.</p>
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- 4 To set the number of measurements to be averaged, tap **Average** and enter a value between 1 and 100.

- 5 To enable the **Interference Rejection** feature, select **On**.

	<p>NOTE:</p> <p>Default setting is Off. It is recommended to use this feature only when you suspect interfering signals in the area as it slows down measurement.</p>
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- 6 *For users with the Bias Tee installed.* To use the Bias Tee, Select **On** for the **Bias Voltage** and input a value between **12** and **30** with 1 V step, as you desire. Tap **Apply** to save the changes.

	<p>NOTE:</p> <p>If you have set this Bias Voltage to On, the instrument will supply a DC bias of set level (12 – 30 V) from the SMA port to an external bias-tee device.</p>
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Performing calibration

Perform the O-S-L-Thru Calibration by tapping the **Cal** icon in the right side bar. The instrument displays on-screen instructions for you to follow through.

Making a measurement

Once the O-S-L calibration is done, the instrument is now ready to make a measurement.

Procedure

- 1 Disconnect the calibrated extension cable from the **Reflection / RF Out** port of the instrument.
- 2 Connect your DUT between the extension cable and the **Reflection / RF Out** port.
- 3 Your measurement result is displayed on the screen in real time.



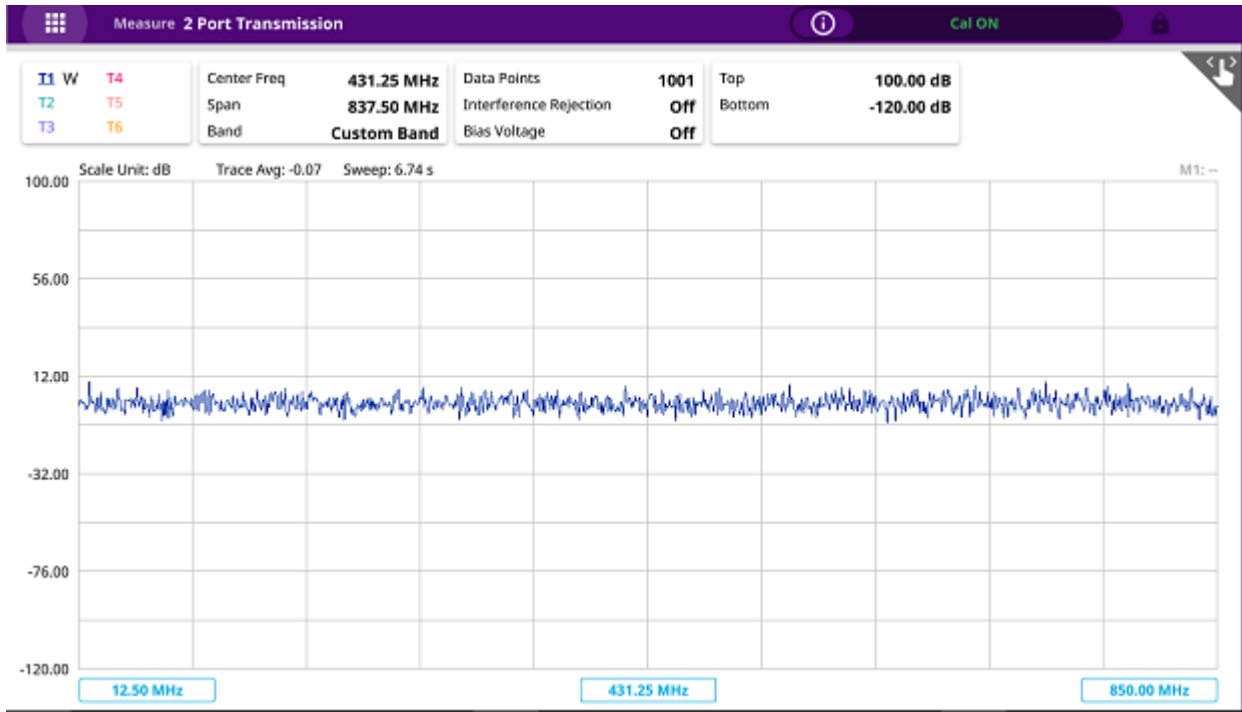
NOTE

Do not change the connected port extension cable or frequency settings, or it may cause a measurement error.

Analyzing measurement results

You can use the Marker, Peak, Trace, Limit, Hold and Auto Scale hard keys and Zoom Zone function for your analysis of the results. You can also use Quick Save, Save and Load functions. See "Analysis" and "Operation" for details.

2 port transmission measurement screen



CW Signal Generating

Introduction

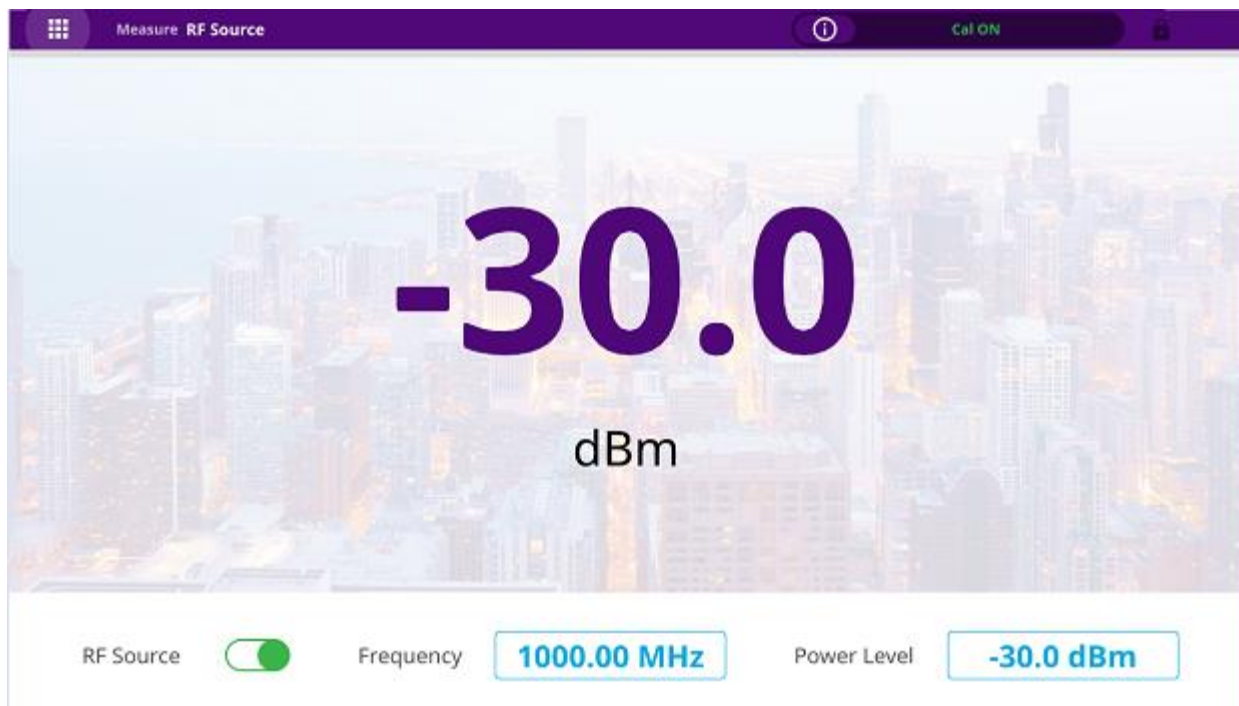
This chapter provides instructions on how to use the CW Signal Generator function. Topics discussed in this chapter are as follows:

- Introducing RF source
 - Using RF source
-

Introducing RF source

If RF CW Source option (CA5000-S006) is installed on your instrument, you can use the RF Source feature to provide different power levels as like using a CW signal generator.

RF source screen



Using RF source

Selecting measurement mode

1 Tap **Single** under the **Mode & Measure**.

2 Double-tap the **RF Source** () icon.



NOTE:

You can choose two measurement modes from each window in the **Horizontal** or **Vertical** tab if you want to view dual measurements displayed on one screen.

Turing on RF source

You can turn on the RF Source feature to generate a CW signal of different output power levels.

- 1 Tap **Frequency box** and input a value within the frequency range of your instrument between **12.5 MHz and 6 GHz** by using the on-screen keyboard and tap **Apply**.
- 2 To set the output level of the CW signal to be injected, tap **Power Level box** and enter a value within the output range for the frequency you have set between **-30 dBm and 10 dBm**.
- 3 To start generating the set signal, tap **RF Source oval** to green. To stop generating the signal, tap **RF Source oval** to gray.

Analysis

Introduction

This chapter provides instructions to analyze measurement results. Topics discussed in this chapter are as follows:


- Using zoom zones
 - Using alternate DTF band
 - Using markers
 - Searching for peak or valley
 - Displaying traces
 - Setting test limits
 - Holding a measurement
-

Using zoom zones

User-definable zones on frequency sub-bands enable visual identification of uplink and downlink frequencies for compliance verification with a single measurement window.

You can use the Zoom function to have a closer look at the user-definable zoom zones in different windows up to four zones. All the four zoom zones are turned off by default. It is available for Reflection, 1 Port Cable Loss, 1 Port Phase and 2 Port Transmission measurement in the single layout view.

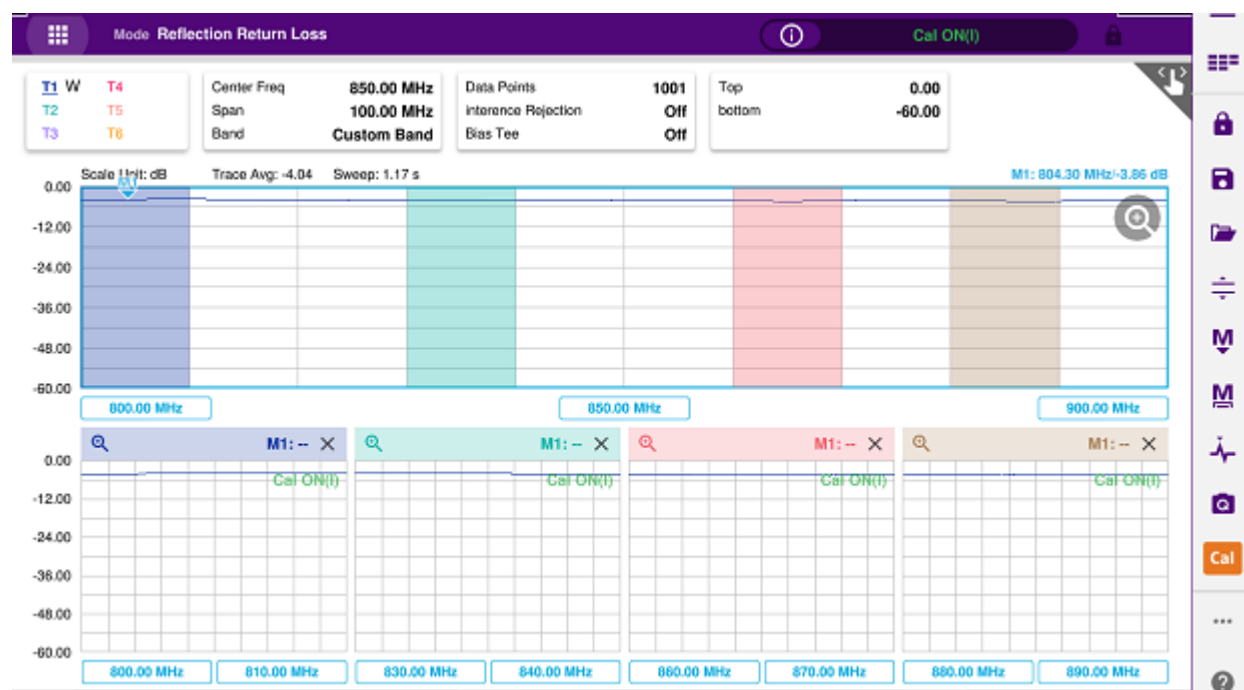
Setting sub-band frequency

- 1 Tap the **Menu** () key on the side bar and tap **Zoom**.
- 2 To enable a zoom zone, select **On** in the **Zone [1|2|3|4]** pane.
- 3 Input the start and stop frequencies for each zoom zone by touching zone start and stop frequency boxes.
- 4 To disable a zoom zone, select **Off** for the zoom zone.

Tips for zoom zones

- 1 The top half of the screen shows the chart with the trace for the full O-S-L calibration band while the bottom half of the screen displays zoom zones that you have enabled in the Zoom setting.
- 2 Individual zoom zones on the screen are independent from one other. Function keys correspond only with the selected zone, which is called as the "active" chart with outside borders surrounded.

Example of zoom zones screen





Using alternate DTF band

You can use the **Alt DTF Band** that is available only in DTF measurements after a calibration to scale down of a specific sub-band without a need of an additional calibration.

Two independent sweeps can be performed, for example, one Reflection measurement and the other DTF measurement.

Setting alternate DTF band

- 1 Tap the **Menu** () key on the side bar and tap **Alt DTF Band**. If you have dual displays on the screen, make sure to select a DTF measurement display for which you like to set. The alternate DTF band setting window appears.
- 2 Select **On** for the **Alt DTF Band** to enable or **Off** to disable. Input the values of **Start Frequency**, **Stop Frequency**, **Center Frequency**, **Span Frequency** using the on-screen keyboard.

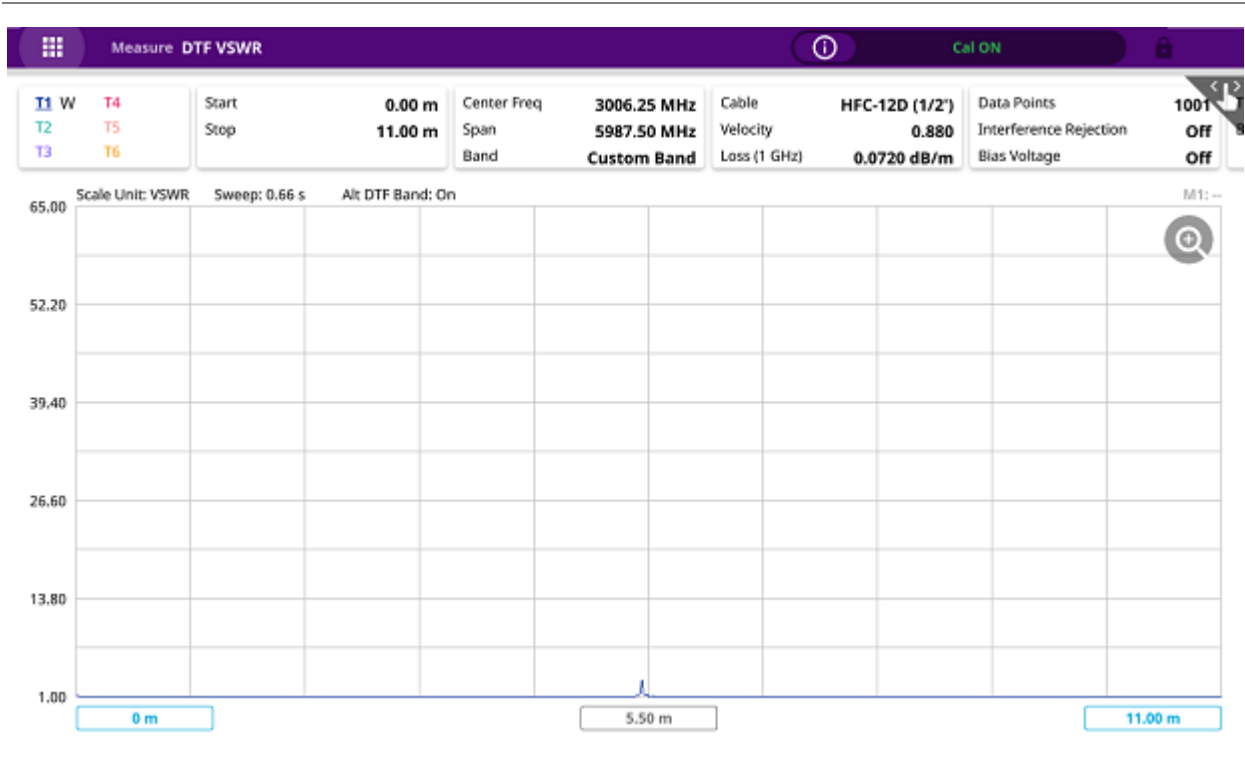


NOTE:

Minimum value for the Alternate Span is 2% of what you have set for the Span in the Frequency/Distance tab.

- 3 Input the **Start Distance** and **Stop Distance**.
- 4 The text "Alt DTF Band: On" appears at the top left corner of the DTF measurement plot.

Example of alternate DTF band




Using markers

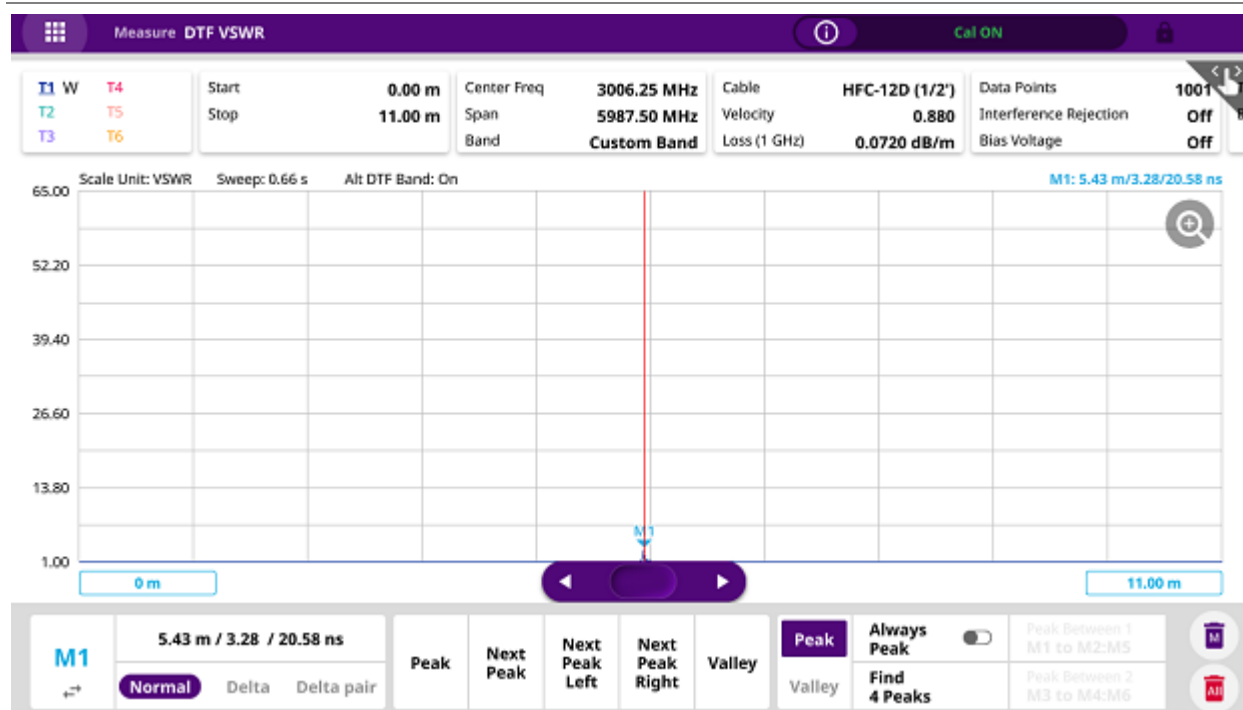
You can have up to six markers on the measurement display simultaneously. The instrument displays the Marker menu in the side-bar on the screen. As you set a marker on the trace, you can see readouts of each marker position that is displayed in its marker screen key on the Marker screen menu bar.

A colorful marker indicates that the marker is the active marker now and you can manipulate it as you like including changing marker type or setting the marker off. The measurement display carries the active marker's position readouts at the top right corner on the display.

Setting a marker

- 1 Tap the marker menu () on the side bar.
- 2 Tap one of the six marker screen keys (M1 to M6), which you like to position on the trace. The active marker's readout is displayed on the screen as shown in below screen capture.
- 3 To change the active marker type, tap the marker number screen key and then select the marker type option from the following choices:
 - **Normal:** A Normal marker provides the reading of a marker position on the trace along with the marker number set between 1 and 6. When you select a marker screen key, the Normal marker type is set by default.
 - **Delta:** 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. This setting is not used in the Smith Chart measurement mode.
 - **Delta Pair:** A Delta Pair marker is associated with a Normal marker. A Normal marker must be set before a Delta Pair marker is set. When the Delta Pair marker is set, the position set by the Delta Pair marker becomes the reference position of the Normal marker and the marker's X and Y values display the difference compared with the Delta Pair marker. The reference position will vary as the trace changes. This setting is not used in the Smith Chart measurement mode.
- 4 Repeat the steps 2-3 to set more markers as needed. If there are two or more markers on the trace, you can change the active marker.
- 5 To set a marker as the active marker, simply tap the marker screen key. The color of the text in the marker's screen key changes from grey to blue to indicate the active marker.

Active marker and its readout



Moving, hiding, and clearing a marker

- To move the active marker, do one of the following:
 - Tap a new position on the trace. The active marker jumps to the new position on the active trace.
 - Tap the new marker in the marker table below. The active marker moves directly to the specified position on the active trace.
- To hide the active marker, complete the following steps:
 - Tap the active marker on the screen and tap the **Marker** to **Off**. To have the marker back on the screen, tap the **Marker** to **On**.



NOTE:


The instrument keeps the last status of marker type and position internally so that you can have the marker back on the trace with the previous information when you select Marker On in the same measurement mode.

- To clear all the markers displayed on the chart, tap any marker screen key that has marker properties. Tap **Marker Clear All** and all the existing markers disappear and their marker properties are deleted.

Searching for peak or valley

You can easily find a peaks or valley on the trace, 4 peaks or valleys, and peak or valley between two markers. When a zoom zone is selected, you will have a different set of menus.

Finding a peak or valley

- 1 Tap the peak search menu, () on the side bar.
- 2 Select one of the Peak screen keys to do tasks as needed, from the following choices:
 - **Peak**: Searches for the highest peak on the trace.
 - **Next Peak**: Searches for the second highest peak on the trace.
 - **Next Peak Left**: Searches for the highest peak to the left from the current position.
 - **Next Peak Right**: Searches for the highest peak to the right from the current position.
 - **Valley**: Searches for the lowest peak (valley) on the trace.
 - **Find 4 Peaks/Valleys**: Searches for four peaks or valleys with four Normal markers from M1 to M4 regardless of the previous marker setting. If you tap the **Find 4 Peaks/Valleys**, the **Always Peak/Valley** automatically changes to Off.
 - **Always Peak/Valley**: Searches for the highest peak or valley on the trace automatically every time the trace is refreshed.
 - **Peak/Valley Between 1**: Searches for the highest peak or valley in between M1 and M2 and automatically assigns M5 if there are M1 and M2 on the trace.
 - **Peak/Valley Between 2**: Searches for the highest peak or valley in between M3 and M4 and automatically assigns M6 if there are M3 and M4 on the trace.


Finding a peak or valley in zoom zones

- 1 After selecting any of the zoom zones enabled on the screen, Tap the peak menu, lower **M** on the side bar for the zoom zones.
- 2 Same choices as above (**Peak** to **Peak/Valley Between 2**) for each zoom zone are supported.

Displaying traces

You can write, capture, and load to 6 traces on the measurement display simultaneously.

Adding a trace

- 1 Tap **Trace** in the **Menu** () key on the side bar. By default, the instrument sets the first trace, **Trace 1** on and displays "T1 W".

- 2 Tap one of the six traces (**Trace 1 to Trace 6**), which you want to set. And tap to **Trace View On**.
- 3 Do one of the options from the following choices:
 - **Clear Write**: Clears current data and writes new measurement.
 - **Capture**: Captures the active trace to compare with other trace(s).
 - **Load**: Loads and overlays a saved trace to do comparison analysis of up to 4 traces by superimposing them on one measurement display.

**NOTE:**

The trace(s) to be overlaid must have the same measurement mode and frequency settings as the current measurement. For the DTF mode, the stop distance setting must be equal or shorter than the one of the current measurement.

- **Trace View On**: Displays the turned-off trace back on the chart.
 - **Trace View Off**: Hides the active trace.
- 4 Repeat the steps 2-3 to set more traces as needed.
 - 5 To clear all the traces displayed on the chart, tap any Trace you want to choose and tap **Trace Clear All**. Then all the existing traces disappear and the default trace T1 is displayed with measurements.

Performing trace math

If you have the traces T1 and T2 on your measurement chart, you can perform trace arithmetic functions.

- 1 Tap **Trace** and select either **Trace 1** or **Trace 2** trace. Tap **Trace Math Type** and do one of the trace math functions from the following choices:
 - **T1+T2**: Adds the traces T1 and T2 and displays the result.
 - **T1-T2**: Subtracts the trace T2 from the trace T1 and displays the result.
 - **T1*T2**: Multiplies the traces T1 and T2 and displays the result.
 - **T1/T2**: Divides the trace T1 by the trace T2 and displays the result.

The Trace Math window appears in the lower half of the screen.

**NOTE:**

Trace math is not available in the DTF and Smith Chart modes.

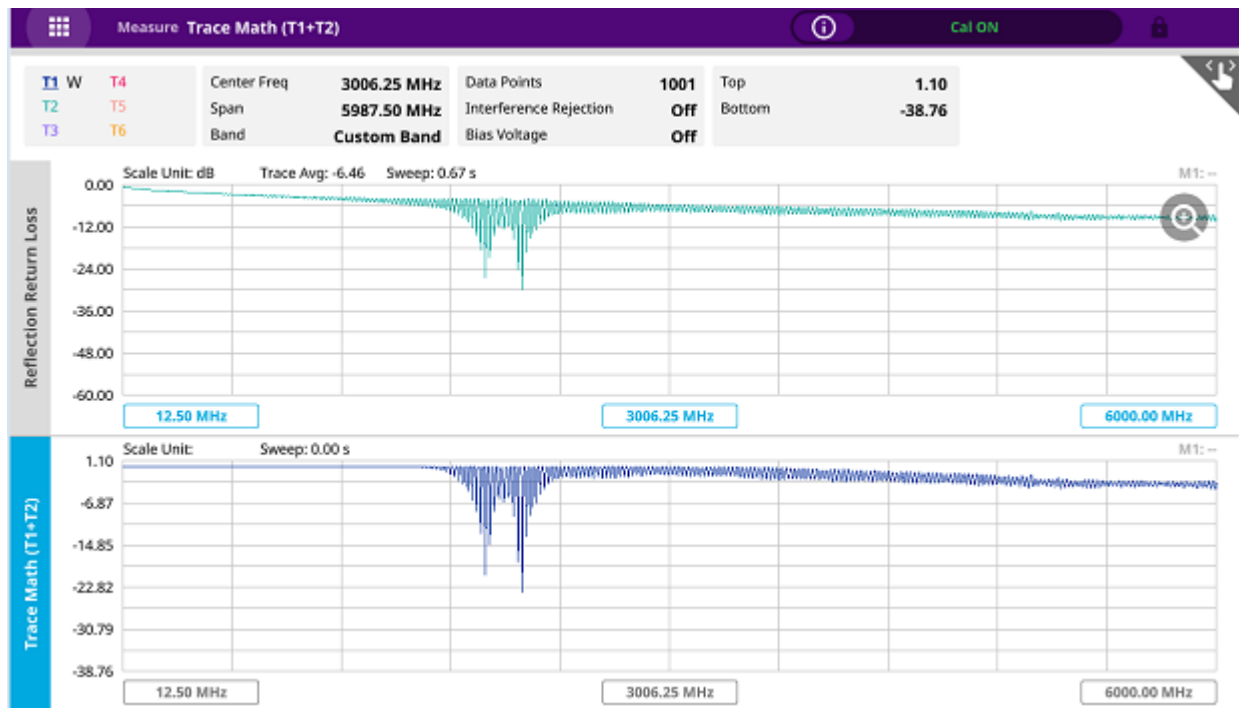
- To turn off the trace math function, tap **Trace Math Type** to **Off**.

Loading a saved trace

You can load a saved trace whenever you need. Unlike the trace overlay, the display layout mode changes to the single display and measurement settings such as measurement mode and X and Y scales are restored as saved.

- 1 To load a save trace, see “**Performing Save and Load**” in Operation book.
- 2 To dismiss the loaded trace data, tap **No Overlay Exit** screen key. Your current measurement appears back on the screen.

Trace screen example



NOTE



You can set the Subframe No. from 0 to 9 and Slot No. between 0 and 1 based on your need using the on-screen keyboard.

Setting test limits

You can define test limits for automatic Pass/Fail and Warning indication and display a limit line with single or multiple segments or a limit window. It makes it easy to verify that a measurement exceeds defined thresholds with alarming option, which sounds if any portion of the trace falls outside the limit settings.


Setting a limit line

The Limit Line is a straight horizontal line that you can enable to analyze your measurement results.

- 1 Tap **Limit** in the **Menu** () key on the side bar.
- 2 Select the **Alarm Sound** option between **On** and **Off**. If you select **On**, the instrument goes off an alarm when a result falls outside of defined limits.
- 3 Select the **Pass/Fail** result option between **On** and **Off**. If you select **On**, the instrument displays “PASS” or “FAIL” result on the screen.
- 4 Tap **Limit Line** and tap **Limit Value** on screen below. Enter a pass/fail threshold value using on-screen keyboard. Then tap **Limit Line** to select **On**. The green limit line appears at the set value on the screen in case of pass.
- 5 Optional. If you have enabled the pass/fail limit line, you can display a warning line. To set the warning threshold, tap **Warning Value** and enter a threshold value using on-screen keyboard. Then tap **Warning Line** to select **On**. The warning line appears at the set value on the screen.
- 6 Optional. To save the limit settings, tap **Save** ().

Setting a Multi Segment limit Line


The Multi-Segment limit Line (**MSL**) is a mask you can define and use to analyze your measurement results.

- 1 Tap **Limit** in the **Menu** () key on the side bar.
- 2 Select the **Alarm Sound** option between **On** and **Off**. If you select **On**, the instrument goes off an alarm when a result falls outside of defined limits.
- 3 Select the **Pass/Fail** result option between **On** and **Off**. If you select **On**, the instrument displays “PASS” or “FAIL” result on the screen.
- 4 Tap **Multi Segment Line** and **Upper/Lower** to select **Upper** or **Lower** as desired.
- 5 To set the number of segments for the **MSL**, tap **Segments**. Enter a value between **1** and **50** using on-screen keyboard.
- 6 Tap **Auto Set** for the instrument to automatically set values for the **MSL** segment(s).
- 7 Tap **Display** and select **On** to display the MSL line.
- 8 To edit each segment of the **MSL**:
 - Tap **Segment Edit** and arrow. The red point indicates your current selection.
 - To select a point to redefine the frequency or amplitude value, tap **Move MSL** and arrow.
 - Do the following as needed:
 - a. To change the X-axis coordinate of the point, tap **Frequency** and enter a value using the on-screen keyboard.

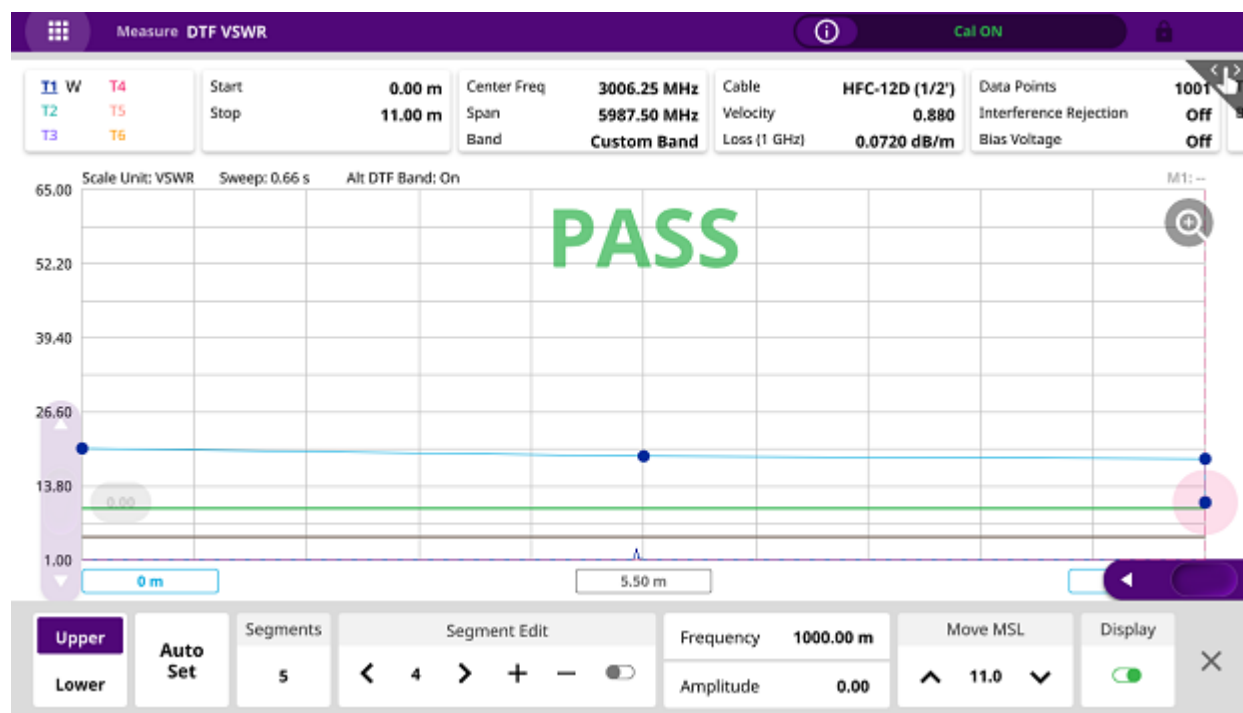
b. To change the Y-axis coordinate of the point, tap **Amplitude** and enter a value using the on-screen keyboard.

c. To add a new segment, tap **Segments** and input the number of segment you want.

9 To move the current MSL line, tap **Move MSL** and enter a value by using the on-screen keyboard.

Optional: To save the limit settings, tap **Save** ().



Upper and lower MSL line



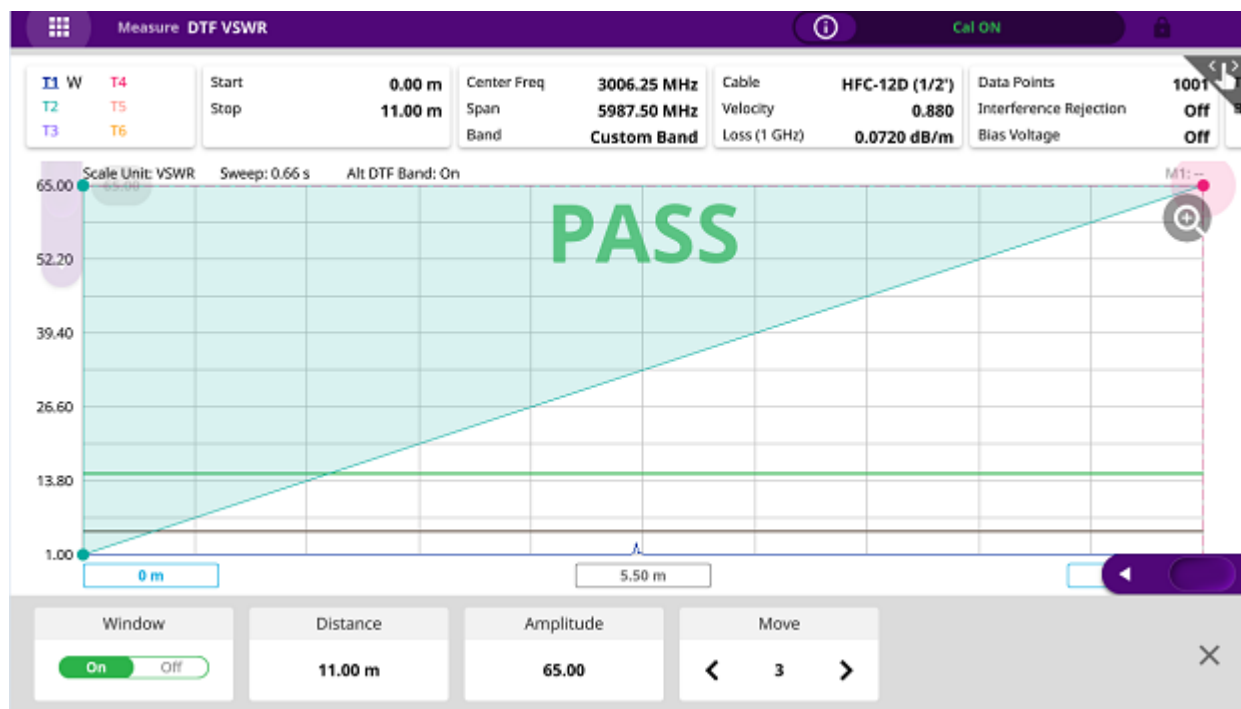
MSL line with red point



Setting a limit window


- 1 Tap **Limit** in the **Menu** () key on the side bar.
- 2 Select the **Alarm Sound** option between **On** and **Off**. If you select **On**, the instrument goes off an alarm when a result falls outside of defined limits.
- 3 Select the **Pass/Fail** result option between **On** and **Off**. If you select **On**, the instrument displays "PASS" or "FAIL" result on the screen.
- 4 Tap **Limit Window** and **Limit Window On/Off** to select **On**. The green limit line appears at the set value on the screen.
- 5 To edit the frequency or amplitude value of the limit window segments, complete the following steps:
 - Tap **Move**. The red point indicates your current selection.
 - To select a point to redefine the frequency or amplitude value, tap the arrow of **Move**. Each time you tap this key, the selection moves to right or left.
 - To change the X-axis coordinate of the point, tap **Frequency / Distance** and enter a value using the on-screen keyboard.
 - To change the Y-axis coordinate of the point, tap **Amplitude** and enter a value using the on-screen keyboard.
 - Optional: To save the limit settings, tap **Save** ().

Limit window



Holding a measurement

You can put a measurement on hold and resume sweeping as needed.

1 Tap **Hold** () icon on the side bar. Sweeping is paused.

2 To resume the measurement, Tap **Hold** () icon again. Sweeping is continued.

Appendix

A. Ordering information

The Warranty Period for VIAVI Solutions Accessories shall apply to all the standard and optional accessories listed below. The warranty period varies by product and is generally 3 years for CAA Modules and 1 year for other accessories unless otherwise specified.

Part #s for CAA06M Cable and Antenna Analyzer

Catalog Number	Description
CAA06MA	6 GHz Cable and Antenna Analyzer Module
CAA06MB	6 GHz Cable and Antenna Analyzer Module with Bias Power and Bias-Tee
CA5000-DMC	Dual Module Carrier with Dummy Module for CellAdvisor 5G
CA5000-S005	2 Port Transmission Measurement (SW option)
CA5000-S006	RF CW Source (SW option)
CAA06M-CR	CAA Module Calibration Report

Part #s for CAA06M Cable and Antenna Analyzer Accessories

Catalog Number	Description
G700050653	Bias-Tee, N(m), N(f), BNC(f), 2.5 to 6000 MHz, 1W with 250 mm BNC(f) to SMA(m) Cable
JD78050509	Y-Calibration Kit, Type-N(m), DC to 6 GHz, 50 ohm

JD78050510	Y-Calibration Kit, DIN(m), DC to 6 GHz, 50 ohm
JD70050509	EZ-Cal kit Type-N(m), DC to 6 GHz, 50 ohm
JD78050507	Dual port Type-N 6 GHz calibration kit
JD78050508	Dual port DIN 6 GHz calibration kit
G700050530	RF cable DC to 8 GHz Type-N(m) to Type-N(m), 1.0 m
G700050531	RF cable DC to 8 GHz Type-N(m) to Type-N(f), 1.5 m
G700050532	RF cable DC to 8 GHz Type-N(m) to Type-N(f), 3.0 m
G710050536	RF cable DC to 6 GHz Type-N(m) to DIN(f), 1.5 m
G700050540	Phase-stable RF cable w grip DC to 6 GHz Type-N(m) to Type-N(f), 1.5 m
G700050541	Phase-stable RF cable w grip DC to 6 GHz Type-N(m) to DIN(f), 1.5 m
G700050571	Adapter Type-N(m) to DIN(f), DC to 7.5 GHz, 50 ohm
G700050572	Adapter DIN(m) to DIN(m), DC to 7.5 GHz, 50 ohm
G700050573	Adapter Type-N(m) to SMA(f) DC to 18 GHz, 50 ohm
G700050574	Adapter Type-N(m) to BNC(f), DC to 4 GHz, 50 ohm
G700050575	Adapter Type-N(f) to Type-N(f), DC to 18 GHz 50 ohm
G700050576	Adapter Type-N(m) to DIN(m), DC to 7.5 GHz, 50 ohm
G700050577	Adapter Type-N(f) to DIN(f), DC to 7.5 GHz, 50 ohm

G700050578	Adapter Type-N(f) to DIN(m), DC to 7.5 GHz, 50 ohm
G700050579	Adapter DIN(f) to DIN(f), DC to 7.5 GHz, 50 ohm
G700050580	Adapter Type-N(m) to Type-N(m), DC to 11 GHz 50 ohm
G700050581	Adapter N(m) to QMA(f), DC to 6.0 GHz, 50 ohm
G700050582	Adapter N(m) to QMA(m), DC to 6.0 GHz, 50 ohm
G700050583	Adapter N(m) to 4.1/9.5 MINI DIN (f), DC to 6.0 GHz, 50 ohm
G700050584	Adapter N(m) to 4.1/9.5 MINI DIN (m), DC to 6.0 GHz, 50 ohm
G700050585	Adapter N(m) to 4.3-10 (f), DC to 6.0 GHz, 50 ohm
G700050586	Adapter N(m) to 4.3-10 (m), DC to 6.0 GHz, 50 ohm
G700050587	Adapter N(f) to SMA(f), DC to 18 GHz, 50 ohm

B. RoHS information

This appendix describes the RoHS (Restriction of Hazardous Substances) information, which is a mandatory requirement from China. The RoHS directive consists in the restriction on the use of certain hazardous substances in electrical or electronic equipment sold or used in the European Union, after July 1, 2006. These substances are: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers.

“中国 RoHS”

《电子信息产品污染控制管理办法》（信息产业部，第 39 号）

附录 (Additional information required for the Chinese Market only)

本附录按照“中国 RoHS”的要求说明了有关电子信息产品环保使用期限的情况，并列出了产品中含有的有毒、有害物质的种类和所在部件。本附录适用于产品主体和所有配件。

产品系列: CA5000
(Product Family)

环保使用期限:



本标识标注于产品主体之上，表明该产品或其配件含有有毒、有害物质（详情见下表）。
其中的数字代表在正常操作条件下至少在产品生产日期之后数年内该产品或其配件内含有的有毒、有害物质不会变异或泄漏。该期限不适用于诸如电池等易耗品。
有关正常操作条件，请参见产品用户手册。
产品生产日期请参见产品的原始校准证书。

有毒、有害物质的类型和所在部件

元器件 (Component)	有毒、有害物质和元素					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬 (Cr ⁶⁺)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
产品主体 (Main Product)						
印刷电路板组件 (PCB Assemblies)	X	O	O	O	O	O
内部配线 (Internal wiring)	X	O	O	O	O	O
显示器 (Display)	O	O	O	O	O	O
电池 (Batteries)	O	O	O	O	O	O
电源 (Power Supply)	O	O	O	O	O	O
电工零件 (Electro-mechanical parts)	O	O	O	O	O	O
光模块 / 辅助模块 (Optical modules) / (Auxiliary modules)	X	O	O	O	O	O
金属外壳零件和紧固件 (Metal case parts and fixings)	X	O	O	O	O	O
塑料外壳零件 (Plastic case parts)	O	O	O	O	O	O
标签和胶带 (Labels and tapes)	O	O	O	O	O	O
配件 (Accessories)						
外接电缆和适配器 (External cables and adapters)	X	O	O	O	O	O
USB	X	O	O	O	O	O
手册和其它印刷材料 (Handbooks and other printed material)	O	O	O	O	O	O
包装箱和缚带 (Carrying case and strap)	O	O	O	O	O	O
其它配件 (Other accessories)	X	O	O	O	O	O
本表是按照 S / T 11364 的规定编制的: O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。 X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。						

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