

## Measurement Guide

# 2-Port Transmission Measurement

for Anritsu RF and Microwave Handheld Instruments

**Site Master™**  
**Spectrum Master™**  
**Cell Master™**

<b>2-Port Transmission Measurement</b>	<b>Option 21</b>
<b>Bias-Tee</b>	<b>Option 10</b>

**Note**

Not all instrument models offer every option. Please refer to the Technical Data Sheet of your instrument for available options.



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# Chapter 1 — General Information

## 1-1 Introduction

This Measurement Guide documents 2-port Transmission Measurement (Option 21) and Bias Tee (Option 10) for the following Anritsu instruments:

- Site Master
- Spectrum Master
- Cell Master

<b>Note</b>	Not all instrument models offer every option. Please refer to the Technical Data Sheet of your instrument for available options.
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## 1-2 Product Information, Compliance, and Safety

Read the Handheld Instruments Product Information, Compliance, and Safety Guide (PN: 10100-00065) for important safety, legal, and regulatory notices before operating the equipment. For additional information and literature covering your product, visit the product page of your instrument on <http://www.anritsu.com/> and select the Library tab.

## 1-3 Contacting Anritsu

To contact Anritsu, please visit:

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

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

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

<http://www.anritsu.com/>

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

## 1-4 General Measurement Setups

The User Guide for the instrument provides a general overview of file management, system settings, and GPS. [Chapter 2](#) of this guide provides specific setup, measurement, and menu information for 2-port transmission measurements.

## 1-5 Selecting 2-Port Transmission Measurement Mode

The current measurement mode is displayed on screen below the battery symbol. To select the 2-Port Transmission Measurement mode:

- Press the **Menu** key and select the Transmission Measurement icon using the touch screen.  
or
- 1. Press the **Shift** key followed by pressing the **Mode** (9) key on the numeric keypad to open the Mode Selector list box.
- 2. Use the directional arrow keys, touchscreen, or the rotary knob to highlight the mode, and press the **Enter** key to select.

# Chapter 2 — 2-port Transmission Measurement (Option 21)

## 2-1 Introduction

The 2-port transmission measurement option provides the capability to perform two-port measurements. This measurement is used to verify the performance of tower-mounted amplifiers, and duplexers, and to verify antenna isolation between two sectors. The excellent dynamic range makes it suitable for repeaters as well.

Both high- and low- power settings are available. The high-power setting delivers approximately 0 dBm power at the RF out port, ideal for antenna isolation measurements and duplexers. When making measurements of a Tower Mounted Amplifier, Anritsu recommends to use the low-power setting (approximately -30 dBm). This will ensure that the RF In port is not over-powered and that the measurements are made in the linear region of the amplifier.

The integrated 32V bias tee (Option 10) enables users to turn on 12 up to 32VDC on the center conductor of the RF In port.

## 2-2 2-port Transmission Setup

This section describes how to set the frequency, amplitude, power level, and number of averages for the 2-port measurement. It also discusses power level, trace math, bias tee, and calibration.

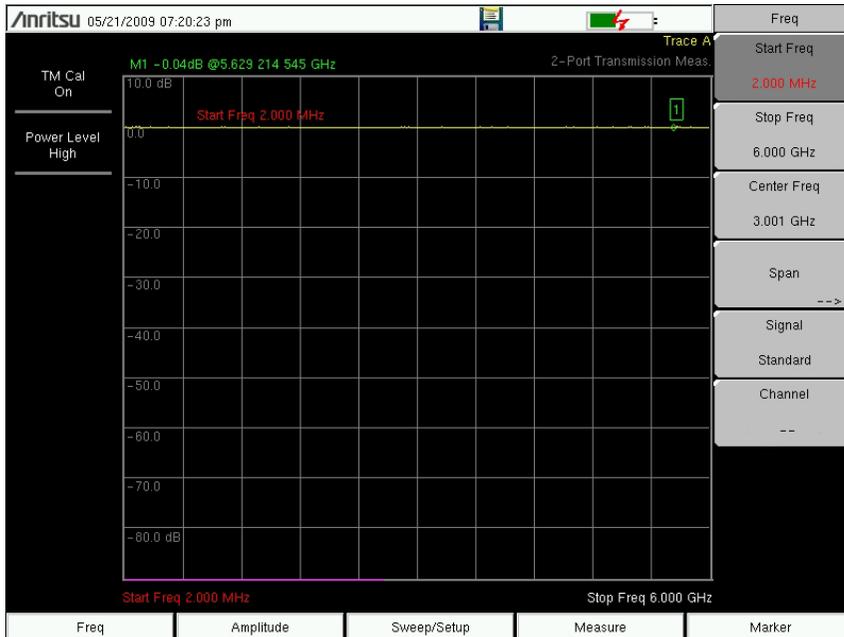


Figure 2-1. Freq Menu

### Frequency

#### Setting up the Measurement Frequency using Start and Stop Frequencies

1. Press the **Freq** main menu key.
2. Press the **Start Freq** submenu key and use the keypad to enter the start frequency. When entering a frequency using the keypad, the submenu labels change to GHz, MHz, kHz, and Hz. Press the appropriate unit key to complete the entry.
3. Press the **Stop Freq** submenu key and use the keypad to enter the stop frequency. Press the appropriate unit key to complete the entry.

#### Setting up the Measurement Frequency by Selecting a Signal Standard

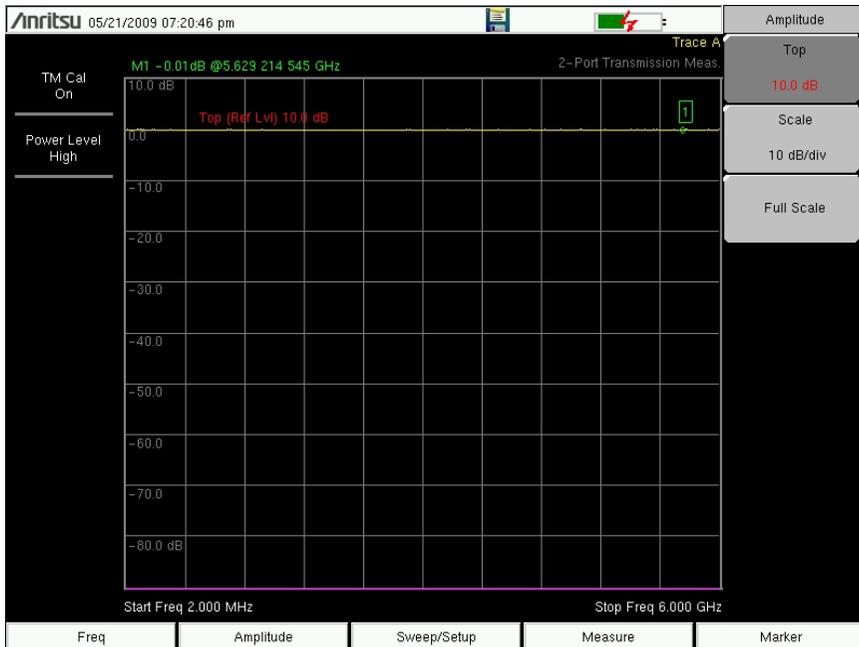
1. Press the **Freq** main menu key.
2. Press the **Signal Standard** submenu key.
3. Use the rotary knob, the arrow keys or the navigation buttons to select the appropriate signal standard and press **Enter** to select.
4. The selected signal standard will be shown in yellow under the date and time in the upper-left of the display.
5. Press the **Channel** key to select a channel number for the selected signal standard.

**Note** Refer to the User Guide for information on selecting and saving favorites.

### Setting up the Measurement Frequency by using Center Freq and Span

1. Press the **Freq** main menu key.
2. Press the Center Freq submenu key and use the keypad to enter the frequency. When entering a frequency using the keypad, the submenu key labels change to GHz, MHz, kHz, and Hz. Press the appropriate unit key to complete the entry.
3. Press the Span key and enter the span using the keypad or the Span Up, Span Down, Full Span, or Zero Span keys.

## Amplitude



**Figure 2-2.** Amplitude Menu

1. Press the **Amplitude** main menu key.
2. Press the Top submenu key and use the keypad, rotary knob, or the **Up/Down** arrow keys to edit the top scale value. Press **Enter** to set.
3. Press the Scale submenu key and use the keypad, rotary knob, or the **Up/Down** arrow keys to edit the scale value. Press **Enter** to set. The scale value can be set from 1 dB/div to 15 dB/div. Full Scale sets the scale at 15 dB/div.

## Sweep/Setup

The sweep/setup menus include keys to set Manual Trigger, Single or Continuous Sweep, Averaging, Output Power, and it also has a selection to turn on high dynamic range mode.

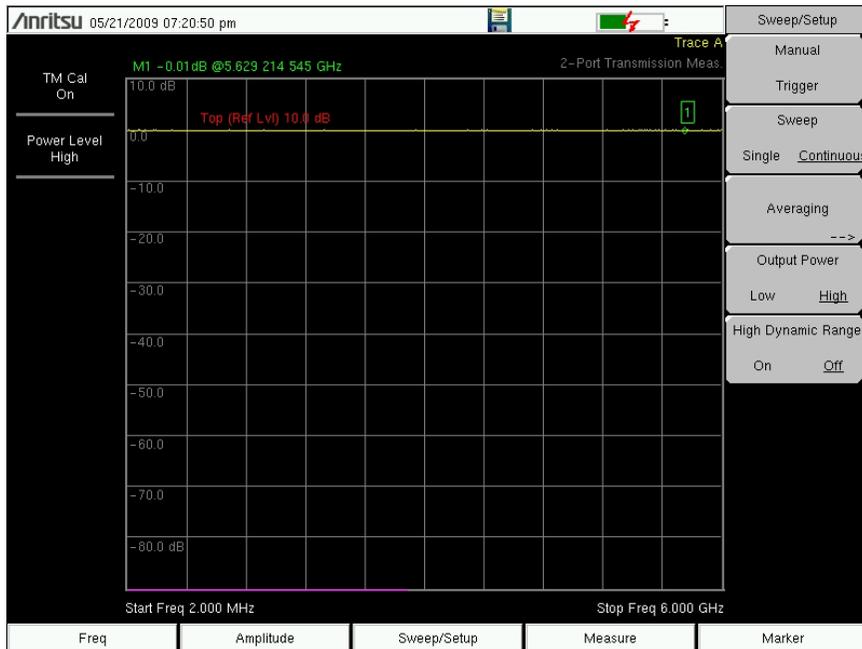


Figure 2-3. Sweep/Setup Menu

### Manual Trigger

Press this submenu key to make a single sweep when the instrument is in single sweep mode. This key has no function when the instrument is in continuous sweep mode.

1. Press the **Sweep/Setup** main menu key.
2. Press the Manual Trigger submenu key.

### Sweep Single/Continuous

This submenu key toggles between continuous sweep and single sweep. In single sweep mode, the results of a sweep are displayed on the screen while the instrument waits for a manual trigger to start a new sweep.

1. Press the **Sweep/Setup** menu key.
2. Toggle the Sweep Single/Continuous key.

## Averaging

Averaging averages the trace to minimize the effect of outliers. Trace averaging takes the running average of the number of traces indicated in the Averaging Factor. The Average Count in the status window turns on if Averaging is turned on. When the Average Count reaches the entered average count, a running average of the last set of sweeps is performed. Averaging Factor can be set between 2 and 65535.

1. Press the **Sweep/Setup** main menu key.
2. Press the Averaging submenu key.
3. Press Averaging Factor and enter the number of running averages using the keypad, then press **Enter**.
4. Press the Averaging On key. The red circle confirms that averaging is on.

## Output Power (Low/High)

The power level defaults to Low ( $\sim -30$  dBm) for all 2-port measurements. This is ideal if you are measuring active devices such as Tower Mounted Amplifiers. The low power setting will ensure the measurement is made in the linear region and that the instrument is not over powered.

Output power set to High ( $\sim 0$  dBm) should only be used when making loss measurements.

Please note that calibration is only valid for the selected output power level.

1. Press the **Sweep/Setup** main menu key.
2. Select the Output Power submenu key and toggle Output Power between High and Low.

## High Dynamic Range

The high dynamic range mode can be used for applications where additional dynamic range is required. Note that the sweep speed slows down in high dynamic range mode.

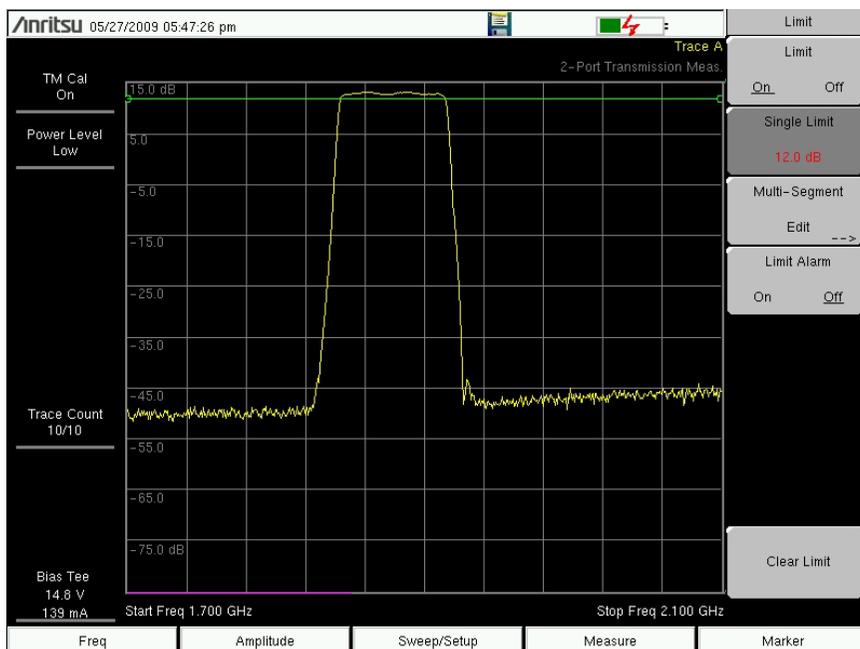
1. Press the **Sweep/Setup** main menu key.
2. Select the High Dynamic Range submenu key and toggle High Dynamic Range between On and Off.

## Limit Lines

Press the **Shift** key and then **Limit** (6) key to display the Limit menu. The instrument supports both single limit and multi-segment limit lines. The multi-segment limit lines can have as many as 40 segments across the entire frequency or distance span. Limit lines can be used for visual reference, or for pass/fail criteria using the limit alarm. Limit alarm failures are reported whenever a signal is above the upper limit line or below the lower limit line. Limit lines are stored with setups and can be recalled at a later time.

### Single Limit Line

1. Press **Shift** and then **Limit** (6) to enter the Limit menu.
2. Press the Limit On/Off key to turn on the Limit.
3. Press Single Limit and then use the numeric keypad, **Up/Down** arrow keys, or the rotary knob followed to change the limit value, then press **Enter**.
4. Press the Limit Alarm key to turn on or off the Limit Alarm.

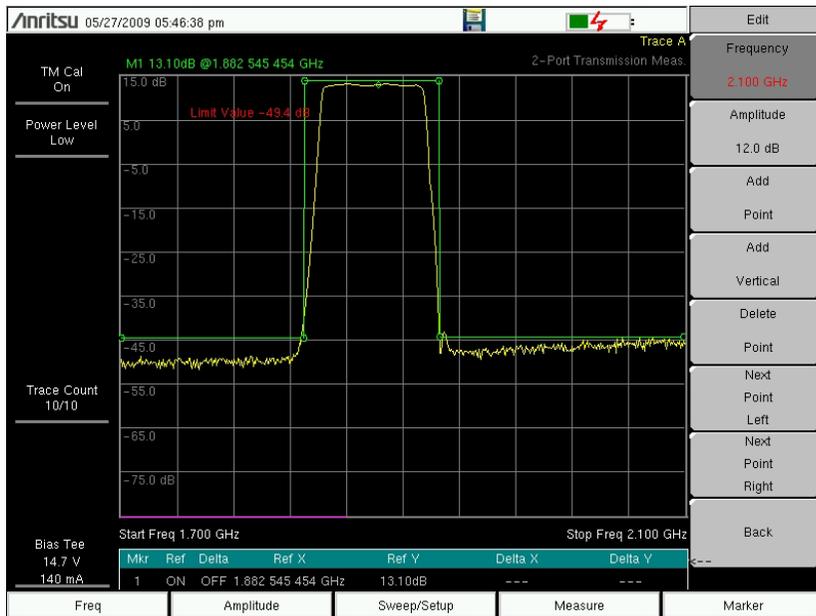


**Figure 2-4.** Single Limit Line

### Adjusting the Volume of Limit Alarm

1. Press **Shift** and then **System** (8).
2. Select the System Options submenu.
3. Press the Volume key.
4. Use the **Up/Down** arrow keys, rotary knob, or enter a value between 1 and 9 to adjust the volume.

## Segmented Limit Lines



**Figure 2-5.** Segmented Limit Line

The following procedure creates a segmented limit line for 2-port measurements. Limits are set to:

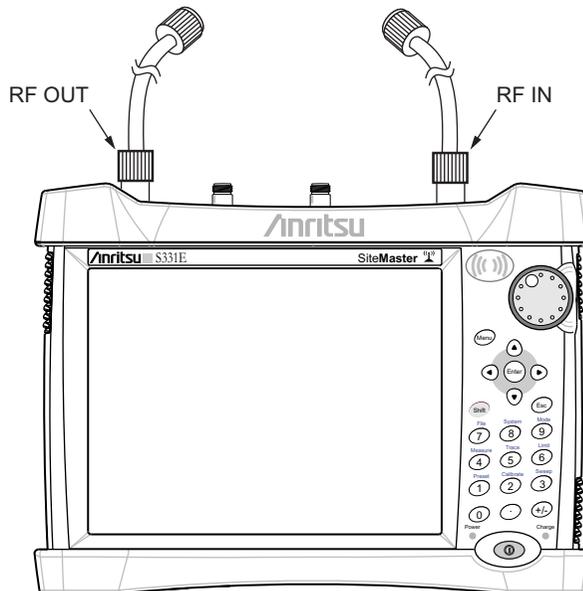
- $-45$  dB between 1700 MHz and 1820 MHz
- 14 dB between 1820 and 1925 MHz, and
- $-45$  dB between 1925 and 2100 MHz.

The frequency is set from 1700 MHz to 2100 MHz.

1. Press **Shift** and then **Limit** (6) to enter the Limit menu.
2. Press the Multi-Segment Edit submenu key.
3. The default limit line has two points. In this example the 3 segments require 6 points. Press the Add Point key four times to add four more points.
4. Press Next Point Left until the highlighted red point is the first point to the left. Press Amplitude and enter  $-45$  dB, press **Enter**.
5. Press Next Point Right and set the Amplitude to  $-45$  dB for the second point from the left. Press Frequency and enter 1820 MHz for the point.
6. Press Next Point Right and set the Amplitude to 0.0 dB for the third point from the left. Press Frequency and enter 1820 MHz.
7. Press Next Point Right and set the Amplitude to 0.0 dB for the fourth point from the left. Press Frequency and enter 1925 MHz.
8. Press Next Point Right and set the Amplitude to  $-45$  dB for the fifth point from the left. Press Frequency and enter 1925 MHz.
9. Press Next Point Right and set the Amplitude to  $-45$  dB for the sixth point from the left. Press Frequency and enter 2100 MHz.

## 2-3 Calibration

For accurate results, the instrument must be calibrated before making 2-port measurements. The instrument must be re-calibrated whenever the temperature exceeds the calibration temperature range or when the test port extension cable is removed or replaced. The instrument must also be re-calibrated every time the setup frequency changes.



**Figure 2-6.** 2-port Calibration

### Calibration Procedure

1. Connect a test port extension cable to the RF Out connector.
2. Connect a second test port extension cable to the RF In connector.
3. Press the **Freq** main menu key, then the **Start Freq** submenu key and enter the start frequency.
4. Press the **Stop Freq** submenu key and enter the stop frequency.
5. Press **Shift** then **Calibrate** (2) to enter the calibration menu.
6. Set the Power Level to Low or High. Only set it to High for passive measurements.
7. Press the **Start Cal** key and follow instructions on the display.
8. Connect the cable connected to RF In to the end of the cable connected to RF Out.

After the calibration is complete, the status display message in the upper left will display "TM Cal On". The trace should be flat at the 0 dB reference line and ready for measurements.

## Save Calibration Setup

1. Press **Shift** then **File** (7) to enter the file menu.
2. Press the **Save** submenu key.
3. Press the **Change Type** key, select **Setup** in the dialog box and press **Enter**.
4. Use the onscreen keyboard to enter the filename and press **Enter**.

**Note**

For details on how to save files and change the save location, refer to the File Management chapter in the Users Guide.

## 2-4 Trace

Pressing the **Shift** key and then **Trace** (5) key brings up the Trace main menu. The trace math feature supports Trace Overlay to allow viewing two traces at the same time to compare a stored trace to a live trace.

Trace Math operations include Trace - Memory. It is possible to copy a trace to display memory directly from the **Trace** menu. Traces can also be recalled from internal memory or downloaded from Master Software Tools into the instrument and compared with live traces.

### Trace Overlay

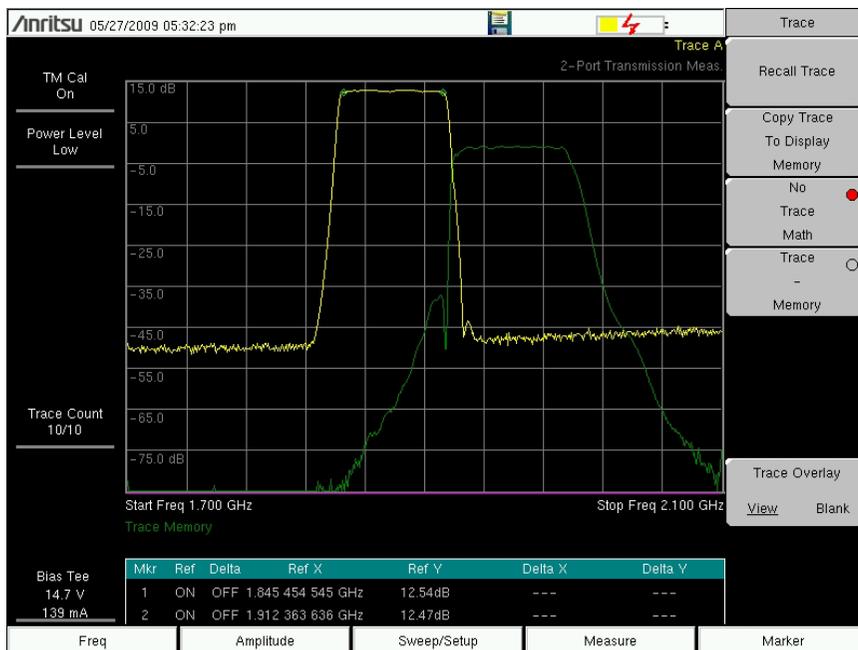
The example below illustrates how the trace overlay feature can be used to compare a trace stored in memory with a live trace.

1. Press **Shift** then **Trace** (5) to enter the Trace Menu.
2. Press Recall Trace and locate the appropriate trace from the recall menu.

**Note** Refer to the User Guide for additional information on the Trace menu.

3. Press the Trace Overlay View/Blank key to turn trace overlay On.

The green trace is the recalled trace from memory, the current trace is yellow.



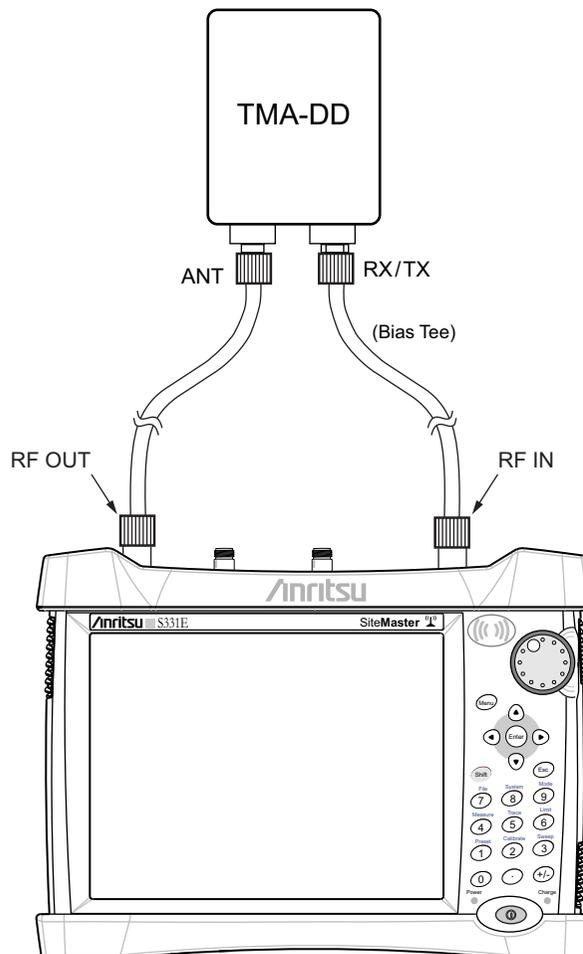
**Figure 2-7.** Trace Overlay of Transmit and Receive Band of a Tower Mounted Amplifier

## 2-5 Bias Tee (Option 10)

Option 10 provides a bias tee that is installed inside the instrument. The bias arm is connected to a 12 VDC to 32 VDC power source that can be turned on as needed to place the voltage on the center conductor of the instrument's RF In port. This supply of bias implies it is mostly useful when conducting two-port transmission measurements. This voltage can be used to provide power to block down-converters in satellite receivers and can also be used to power some tower-mounted amplifiers.

The bias can be turned on only when the instrument is in transmission measurement, return loss, cable loss, VSWR, DTF, Spectrum Analyzer, Channel Scanner, or Interference Analyzer mode. When bias is turned on, the bias voltage and current are displayed in the lower left corner of the display. The 12 VDC to 32 VDC power supply is designed to continuously deliver a maximum of 6 Watts.

The bias tee menu can be accessed from the applications options menu and in transmission measurement, it can also be accessed from the **Measure** main menu.



**Figure 2-8.** Variable Bias Tee

## 2-6 Measurements

This section shows how to use the instrument to make 2-port measurements of Tower Mounted Amplifiers and duplexers.

### Tower Mounted Amplifier Measurement

The procedure below describes how to use the instrument and the internal bias tee (option 10) to make a 2-port measurement of the Rx band of a Simplex 1850 to 1990 MHz Tower Mounted Amplifier (refer to [Figure 2-9](#) and [Figure 2-10](#)).

1. Press the **Menu** or **Mode** key and select Transmission Measurement.
2. Press the **Freq** main menu key and set the start and stop frequencies
3. Connect a cable to RF Out and a second cable to RF In.
4. Open the Calibration menu by pressing **Shift** then the **Calibrate (2)** key.
5. Verify that the **Power Level** is set to Low. Note that the power level should always be set to low when making gain measurements of active devices such as tower mounted amplifiers.
6. Press the **Start Cal** key and follow instructions on the display.

After the calibration is complete, the status display message in the upper-left of the display should show “TM Cal On”.

The trace should be flat at the zero dB reference line and ready for measurements.

7. Connect the cable connected to RF Out to the ANT port of the TMA.
8. Connect the cable connected to RF In to the Rx/Tx port of the TMA.
9. Press the **Measure** main menu key, then the **Bias Tee** submenu key. Confirm that the Bias Tee is On.
10. Press the **Marker** main menu key. Select a marker and move it to the desired frequency and verify the gain of the TMA. Refer to [“Marker Menu” on page 2-26](#) for additional information on using markers.

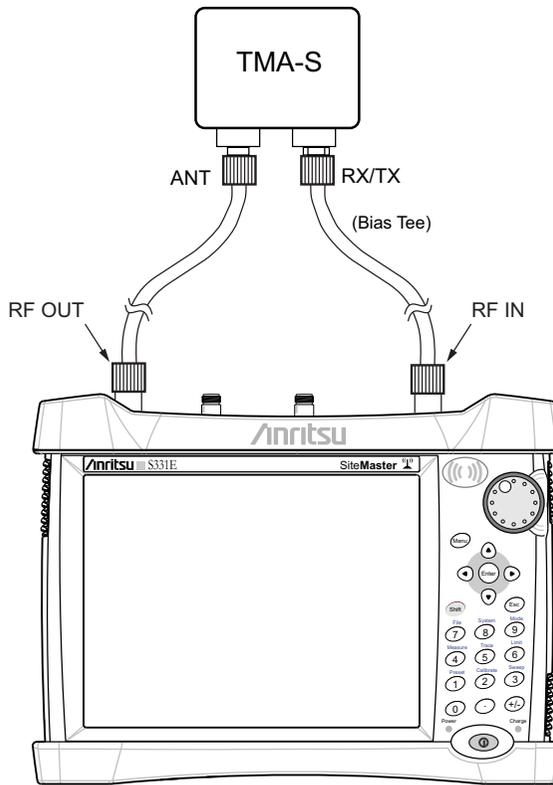


Figure 2-9. Setup for 2-port Measurement to Verify Gain of a TMA

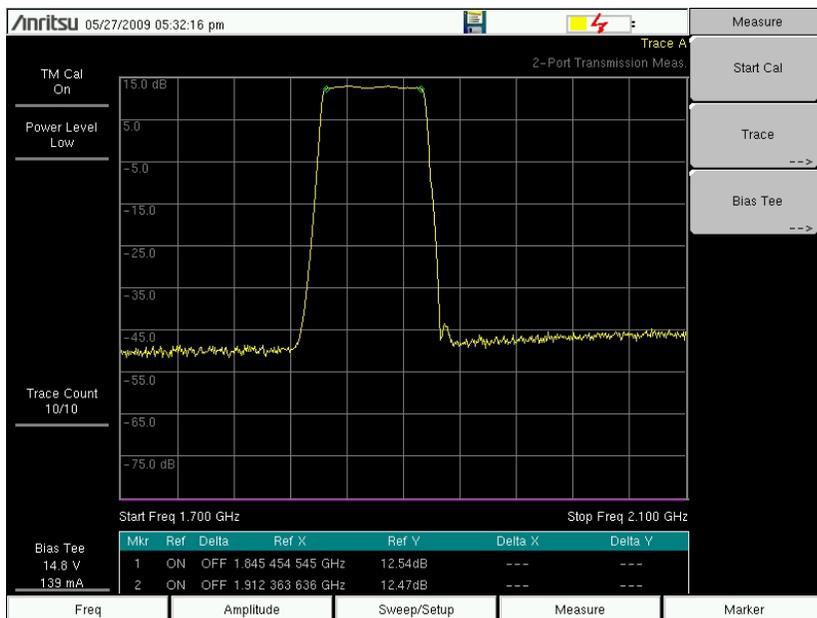
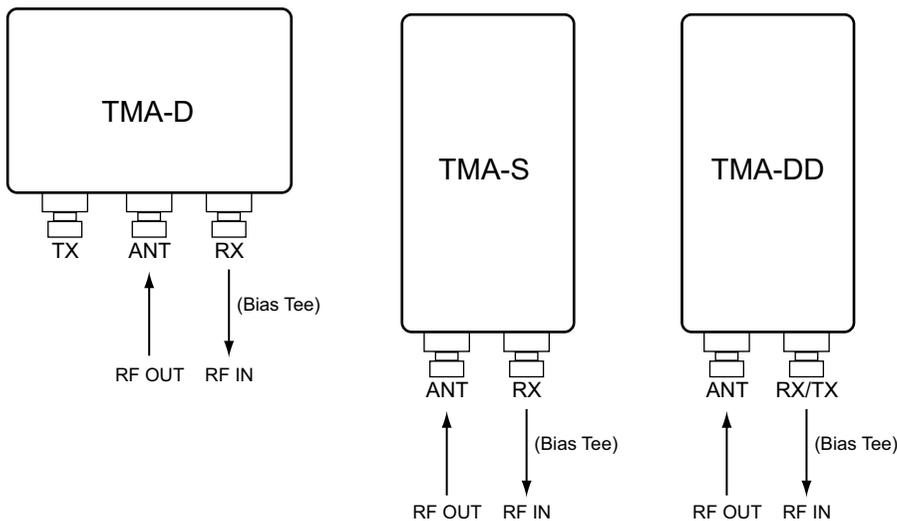


Figure 2-10. Display Confirming the Gain of a TMA

## 2-7 TMA Configurations

A Tower Mounted Amplifier (TMA) can be used to amplify the received signal. There are different types of TMA depending upon the system requirements. Three commonly used types are:

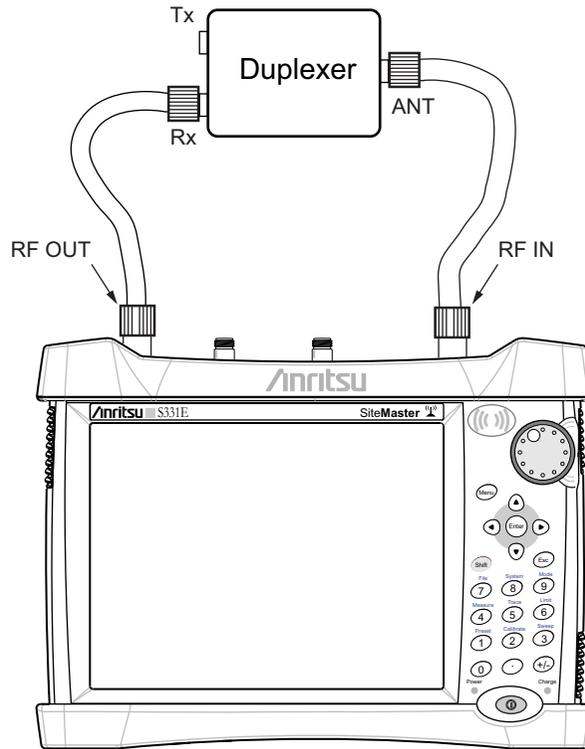
- **TMA-D:** A duplex tower mounted amplifier that combines transmit and receive ports from the radio system and connects to a single antenna. This configuration is specific to systems that use a single antenna configuration.
- **TMA-S:** A receive-only tower mounted amplifier is installed between the receiving antenna and the radio to boost weak signals. This configuration is common on systems that implement separate antennas for transmitting and receiving.
- **TMA-DD:** A dual-duplex tower mounted amplifier used for radio systems with a single transmission line connection for transmit and receive. These systems are commonly called transceivers.



**Figure 2-11.** Tower Mounted Amplifiers

## 2-8 Duplexer Measurement

The procedure below describes how to use the instrument to measure a duplexer.



**Figure 2-12.** Setup to Measure a Duplexer

1. Press the **Menu** or **Mode** key and select Transmission Measurement.
2. Press the **Freq** main menu key and set the start and stop frequencies
3. Connect a cable to RF Out and a cable to RF In.
4. Open the Calibration Menu, **Shift** then **Calibration** (2) key.
5. Verify that Power Level is set to High.
6. Press the Start Cal submenu key and follow instructions on the display.  
After the calibration is complete, the status display message in the upper left will display “TM Cal On”.  
The trace should be flat at the 0 dB reference line and ready for measurements.
7. Connect the cable connected to RF Out of the instrument to the Rx port of the Duplexer.
8. Connect the cable connected to RF In to the ANT port of the duplexer.
9. Open the Trace main menu **Shift** then **Trace** (5) and press Copy Trace To Display Memory.
10. Disconnect the cable from the Rx port and connect it to the Tx port of the duplexer
11. Toggle Trace Overlay to View ([Figure 2-13 on page 2-16](#)) to compare the traces.

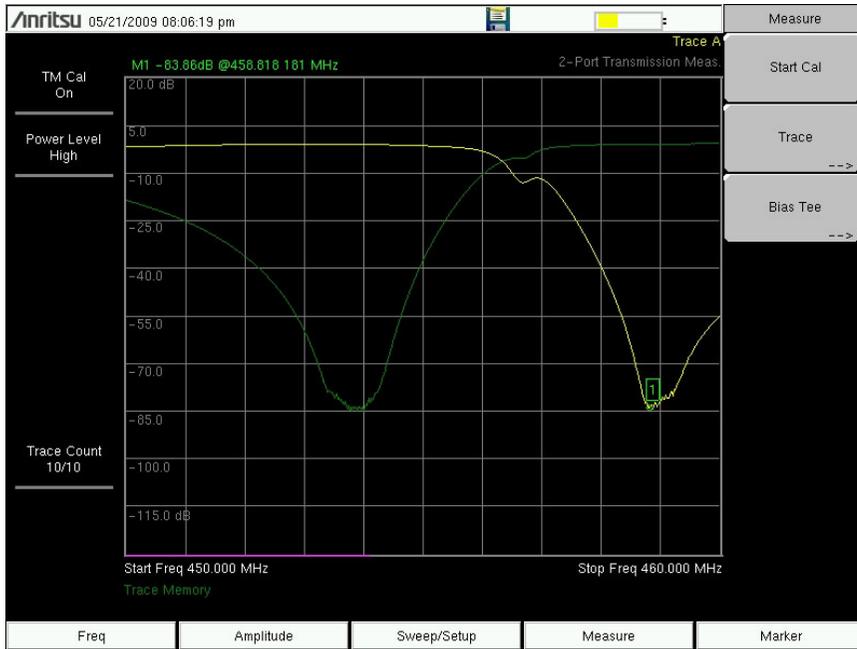


Figure 2-13. 2-port Measurement of a 450 to 470 MHz Duplexer

## 2-9 2-port Transmission Menus

Figure 2-14 and Figure 2-15 show the map of the 2-Port Transmission menus. The following sections describe 2-port Transmission main menus and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.

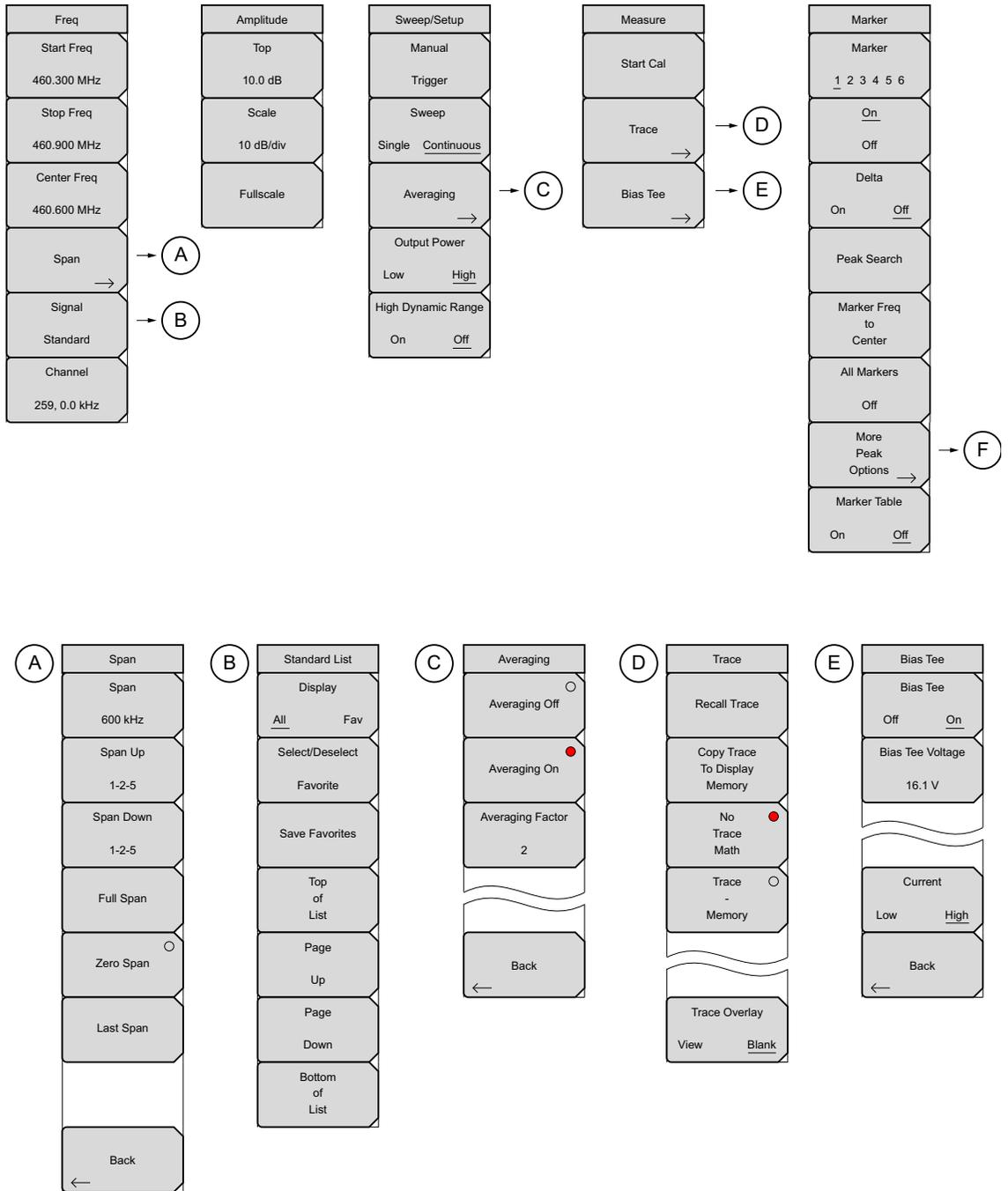


Figure 2-14. Main Menu Keys

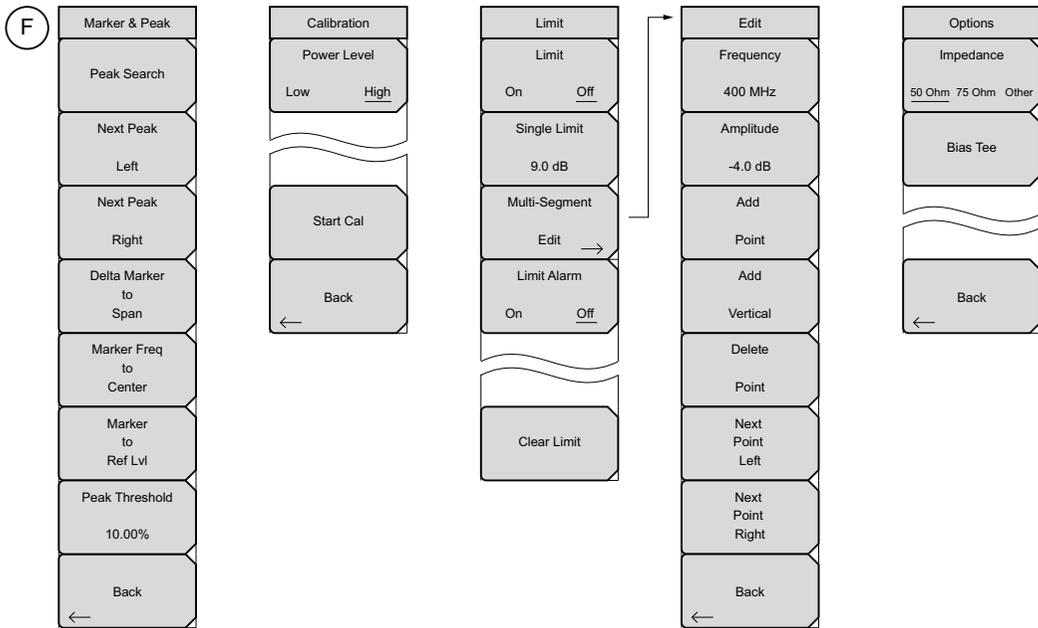


Figure 2-15. Main Menu Keys

## 2-10 Freq (Frequency) Menu

Key Sequence: **Freq**

The tuning frequency range can be entered in several different ways depending upon what makes the most sense for the user or for the application. The center frequency and span can be specified, the start and stop frequencies can be entered, or a signal standard and channel number can be selected from the built-in list.

Freq	<b>Start Freq:</b> Press the Start Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob.
Start Freq 460.300 MHz	<b>Stop Freq:</b> Press the Stop Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob.
Stop Freq 460.900 MHz	<b>Center Freq:</b> Press the Center Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob.
Center Freq 460.600 MHz	<b>Span:</b> Press the <b>Freq</b> main menu key followed by the Span submenu key and enter the desired span. The Span menu is used to set the frequency range over which the instrument will sweep. The span can be set from 10 Hz to the maximum frequency range the instrument will support. See the product specifications for the maximum frequency. Span can also be set to zero span.
Span →	The submenu key shows the current value for span in units of GHz, MHz, kHz, or Hz. When the Span button is pressed, span becomes the active parameter and may be changed. Use the keypad, the directional arrow keys or the rotary knob to increase or decrease the span frequency. If the span is changed using the arrow keys, the span changes in a 1-2-5 sequence of the Frequency Step for each key press. See the <a href="#">“Span Menu” on page 2-20</a> .
Signal	<b>Note:</b> In the above submenus, when entering a frequency using the keypad, the submenu key labels change to GHz, MHz, kHz, and Hz. Press the appropriate units key. Pressing the <b>Enter</b> key has the same affect as the MHz submenu key.
Standard	<b>Signal Standard:</b> Use the <b>Up/Down</b> arrow keys or the rotary knob to highlight a signal standard and press <b>Enter</b> to select. See <a href="#">“Span Menu” on page 2-20</a> .
Channel 259, 0.0 kHz	When a signal standard is selected, the center frequency and span for the first channel of the last segment of the particular standard is automatically tuned. Other settings, such as channel spacing and integration bandwidth, are also automatically entered.
	<b>Channel #:</b> Use the <b>Up/Down</b> arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the spectrum analyzer display.

**Figure 2-16.** Frequency Menu

## Span Menu

The Span menu is used to set the frequency range over which the instrument will sweep. The span can be set from 10 Hz to maximum frequency of the unit. The Span can also be set to zero span or full span.

Key Sequence: **Freq > Span**

Span	<b>Span:</b> This submenu key shows the current value for span in units of GHz, MHz, kHz, or Hz. When the Span button is pressed, span becomes the active parameter and may be changed. Use the keypad, the directional arrow keys, or the rotary knob to increase or decrease the span frequency.
Span 600 kHz	
Span Up 1-2-5	<b>Span Up 1-2-5:</b> This is a convenient way to quickly arrive at a wider span value. The first time the submenu key is pressed, the span value increases to the nearest even value that starts with 1, 2, or 5. For example if the span is 1.8 MHz, pressing the submenu key for the first time changes the span to 2.0 MHz, the next press takes the value to 5.0 MHz and so on.
Span Down 1-2-5	<b>Span Down 1-2-5:</b> This is a convenient way to narrow the frequency span. The first time the submenu key is pressed, the span value decreases to the nearest even value that starts with 1, 2, or 5. For example if the span is 1.8 MHz, pressing the submenu key for the first time changes the span to 1.0 MHz, the next press takes the value to 500 kHz, then 200 kHz and so on.
Full Span	<b>Full Span:</b> Pressing this button sets the span to cover the entire tunable spectrum of the unit.
Zero Span <input type="radio"/>	<b>Zero Span:</b> This submenu key sets zero span. In this mode the display shows amplitude changes at a single frequency. This function is frequently used to allow the easy monitoring of power variations over time. For example, if information about the amplitude of an 802.11a access point signal is needed, the access point frequency would be set as the center frequency, resolution bandwidth would be set to a value wide enough to encompass as much of the signal as possible and the tester would walk around the access point useable area while the instrument records the amplitude using slow sweep.
Last Span	<b>Last Span:</b> This submenu key returns the span to the most recent span value immediately before a change was made.
Back ←	<b>Back:</b> Returns to <a href="#">“Freq (Frequency) Menu” on page 2-19.</a>

**Figure 2-17.** Span Menu

## Standard List Menu

The Standard List Menu is used for moving within the Signal Standards window, selecting or deselecting a favorite signal standard, and saving a signal standard to the favorites list.

Key Sequence: **Freq** > Signal Standard

Standard List	<b>Display All/Fav:</b> Toggles between showing all signal standards or displaying the signal standard selected as favorites.
Display <u>All</u> Fav	<b>Select/Deselect Favorite:</b> Selects the signal standard in the dialog box. Signal names selected as favorites have an "*" in the Fav column of the dialog box. Press <b>Enter</b> or Save Favorites to save.
Select/Deselect Favorite	<b>Save Favorites:</b> Saves the signal selected to the favorites list.
Save Favorites	<b>Top of List:</b> Moves the selection to the first signal standard in the list.
Top of List	<b>Page Up:</b> Moves up one page view from the current signal name.
Page Up	<b>Page Down:</b> Moves down one page view from the current signal name.
Page Down	<b>Bottom of List:</b> Moves the selection to the last signal standard in the list.
Bottom of List	Press <b>Esc</b> to return to the " <a href="#">Freq (Frequency) Menu</a> " on page 2-19.

**Figure 2-18.** Span Menu

## 2-11 Amplitude Menu

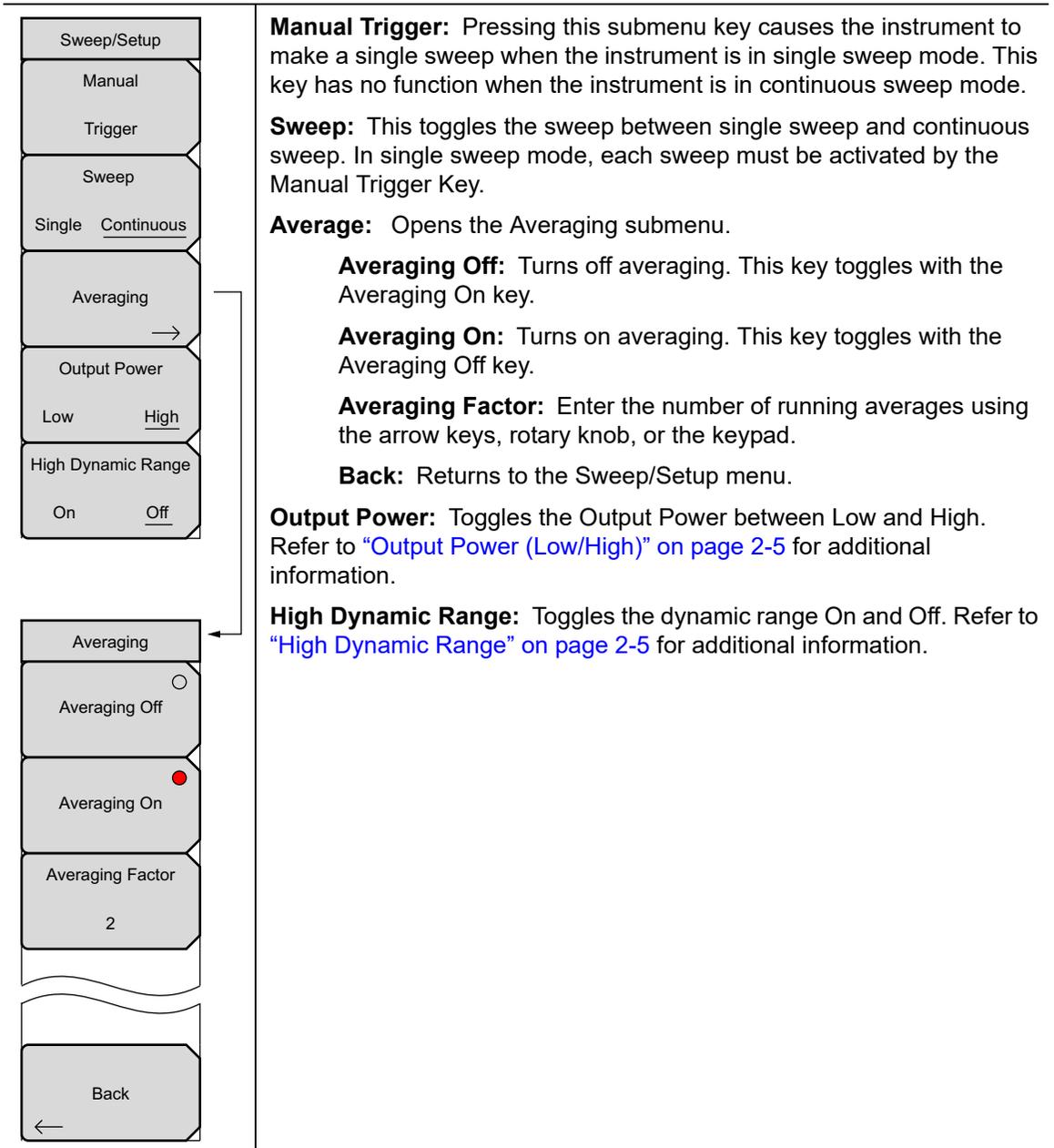
Key Sequence: **Amplitude**

Amplitude	<b>Top:</b> Sets the top amplitude value.
Top 10.0 dB	<b>Scale:</b> The scale can be set in 1 dB steps from 1 dB per division to 15 dB per division. The value can be changed using the keypad, the rotary knob or the arrow keys.
Scale 10 dB/div	<b>Fullscale:</b> Fullscale automatically sets the instrument to the maximum amplitude range.
Fullscale	

**Figure 2-19.** Amplitude Menu

## 2-12 Sweep/Setup Menu

Key Sequence: **Sweep/Setup**



**Figure 2-20.** Sweep/Setup Menu

## 2-13 Measure Menu

Key Sequence: **Measure**

	<p><b>Start Cal:</b> Start the 2-port calibration. Refer to “<a href="#">Calibration</a>” on page 2-8 for additional Information</p> <p><b>Trace:</b> Opens the “<a href="#">Trace Menu</a>” on page 2-24.</p> <p><b>Bias Tee:</b> Opens the “<a href="#">Bias Tee Menu</a>” on page 2-25.</p>
--	--

**Figure 2-21.** Measure Menu

## Trace Menu

Key Sequence: **Measure** > Trace

	<p><b>Recall Trace:</b> Opens the Recall dialog box to recall a previously saved measurement. See the User Guide for more information about recalling measurements. If the setup of the recalled trace is the same as the current settings, the trace is displayed in white and copied to display memory for use in Trace Math.</p> <p><b>Copy Trace to Memory:</b> Copies the current trace display to memory for use in Trace Math.</p> <p><b>No Trace Math:</b> The active trace is shown as is with no math functions.</p> <p><b>Trace – Memory:</b> Displays the difference between the active trace and the trace in memory.</p> <p><b>Trace Overlay:</b> Displays both the recalled trace (green) if a trace is stored in memory and the current trace (yellow).</p>
--	---

**Figure 2-22.** Trace Menu

## Bias Tee Menu

Key Sequence: **Measure** > Bias-Tee

Bias Tee	<b>Bias Tee:</b> Toggles On and Off the variable power supply.
Bias Tee Off <u>On</u>	<b>Bias Tee Voltage:</b> Use this submenu to set the power supply voltage. The current Bias Tee voltage selection is shown in red near the top of the graticule.
Bias Tee Voltage 16.1 V	<b>Current:</b> Toggle the bias tee current between Low and High.
	<b>Back:</b> Press this submenu key to return to the <a href="#">“Measure Menu” on page 2-24</a> .
Current Low <u>High</u>	
Back ←	

**Figure 2-23.** Bias Tee Menu

## 2-14 Marker Menu

Key Sequence: **Marker**

Press the **Marker** main menu key to open the Marker menu. The instrument is equipped with six markers. Any or all markers can be employed simultaneously.

Marker	<b>Marker:</b> Selects the active marker (1 to 6). The underlined marker number is the active marker. Press the key to open the Select Marker dialog box and select the marker to be active. Set the location of the marker with the arrow keys, rotary knob, or keypad.
Marker <u>1</u> 2 3 4 5 6	
<u>On</u> Off	<b>On/Off:</b> Turns the selected marker underlined in the Marker key On or Off.
Delta On <u>Off</u>	<b>Delta On/Off:</b> Turns on or off the delta marker. Set the location of the Delta marker with the arrow keys, rotary knob, or keypad.
Peak Search	<b>Peak Search:</b> This submenu key places the currently active marker on the highest signal amplitude currently displayed on screen.
Marker Freq to Center	<b>Marker Freq to Center:</b> Moves the frequency noted by the active marker to the center frequency position and center of the display.
All Markers Off	<b>All Markers Off:</b> Clears the display of all active markers.
More Peak Options →	<b>More Peak Options:</b> Brings up a secondary menu of keys for more peak searching options. See the <a href="#">“Marker &amp; Peak Menu” on page 2-27</a> .
Marker Table On <u>Off</u>	<b>Marker Table On/Off:</b> Causes a table to be displayed below the sweep window. The table is automatically sized to display all markers that are turned on. In addition to the marker frequency and amplitude, the table also shows delta frequencies and amplitude deltas for all markers that have deltas entered for them.

Figure 2-24. Marker Menu

## Marker & Peak Menu

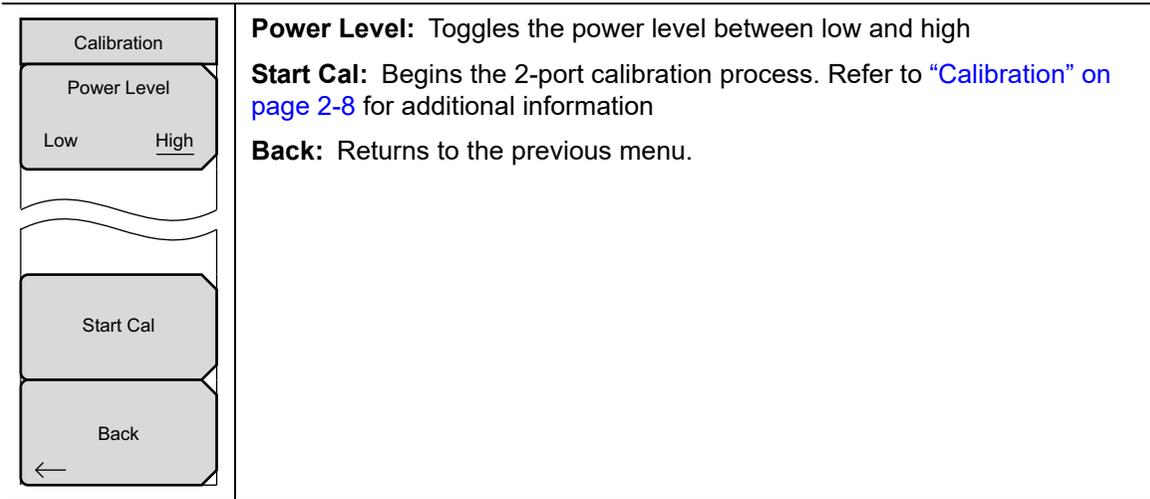
Key Sequence: **Marker** > More Peak Options

Marker & Peak	<b>Peak Search:</b> Places the currently active marker on the highest amplitude signal currently on screen.
Peak Search	<b>Next Peak Left:</b> From the current position of the active marker, the instrument searches to the left (toward lower frequencies) for a peak signal that rises at least a certain amount above the average noise level. If no such peak is found, the marker is placed at the left end of the trace. The Peak Threshold submenu key allows the user to specify the performance of peak searching.
Next Peak Left	
Next Peak Right	<b>Next Peak Right:</b> From the current position of the active marker, the instrument searches to the right (toward higher frequencies) for a peak signal that rises at least a certain amount above the average noise level. If no such peak is found, the marker is placed at the right end of the trace. The Peak Threshold submenu key allows the user to specify the performance of peak searching.
Next Peak Right	
Delta Marker to Span	<b>Delta Marker to Span:</b> Sets the total span width to the value of the delta marker. If the delta marker is zero, the span is set to 10 Hz. If there is no delta marker, or the delta marker value is set to less than 10 Hz, then the span will be set to 10 Hz.
Marker Freq to Center	<b>Marker Freq to Center:</b> Sets the center frequency to the frequency of the currently active marker.
Marker to Ref Lvl	<b>Marker to Ref Lvl:</b> Sets the reference level, top graticule line, to the amplitude of the currently active marker.
Peak Threshold 10.00%	<b>Peak Threshold:</b> Allows the user to specify how far above the average noise floor a signal must rise before it is considered a peak.
Back ←	<b>Back:</b> Returns to the <a href="#">“Marker Menu” on page 2-26</a> .

Figure 2-25. Marker & Peak Menu

## 2-15 Calibrate Menu

Key Sequence: **Shift** > **Calibrate** (2) key



**Power Level:** Toggles the power level between low and high

**Start Cal:** Begins the 2-port calibration process. Refer to [“Calibration” on page 2-8](#) for additional information

**Back:** Returns to the previous menu.

Figure 2-26. Calibrate Menu

## 2-16 Sweep Menu

Key Sequence: **Shift** > **Sweep** (3) key

Refer to the [“Sweep/Setup Menu” on page 2-23](#).

## 2-17 Measure Menu

Key Sequence: **Shift** > **Measure** (4) key

Refer to the [“Measure Menu” on page 2-24](#).

## 2-18 Trace Menu

Key Sequence: **Shift** > **Trace** (5) key

Refer to the [“Trace Menu” on page 2-24](#).

## 2-19 Limit Menu

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

Each limit line can consist of a single segment, or as many as 40 segments across the entire frequency span of the instrument. These limit segments are retained regardless of the current frequency span of the instrument, allowing the configuring of specific limit envelopes at various frequencies of interest without having to re-configure them each time the frequency is changed. To clear the current limit setup configuration and return to a single limit segment starting at the current start frequency and ending at the current stop frequency, press the Clear Limit submenu key.

Key Sequence: **Shift** > **Limit** (6) key

Limit	<b>Limit On/Off:</b> This key toggles limit lines on or off.
Limit On <u>Off</u>	<b>Single Limit:</b> This key creates a single segment limit line. The amplitude of the limit line is adjusted with the arrow keys, rotary knob, or the numeric keypad.
Single Limit 9.0 dB	<b>Multi-Segment Edit:</b> The <a href="#">“Limit Edit Menu” on page 2-30</a> is displayed to allow the creation or editing of single or multi-segment limit lines. The currently active limit point is marked by a red circle on the display.
Multi-Segment Edit →	<b>Limit Alarm:</b> This submenu key selects, for the currently active limit line, if an alarm beep will occur when a data point exceeds the limit.
Limit Alarm On <u>Off</u>	<b>Clear Limit:</b> This submenu key deletes all limit points for the currently active limit line.
Clear Limit	

**Figure 2-27.** Limit Menu

## Limit Edit Menu

Key Sequence: **Shift** > **Limit** (6) key > Limit Edit

Edit	<p><b>Frequency:</b> The frequency of each point in a limit line can be individually set. When a new point is added, it takes on a value halfway between two existing points, or the stop frequency of the current sweep if there is no point higher in frequency than the one being added. See the Add Point submenu key description for more details. Use the keypad, the <b>Left/Right</b> arrow keys or the rotary knob to change the frequency of a point.</p> <p><b>Amplitude:</b> The amplitude of each limit point can also be individually set. By default, when a new point is added, it takes on the amplitude that is on the limit line at the frequency where the point was added. Use the keypad, the <b>Up/Down</b> arrow keys, or the rotary knob to move the point to the desired value. The unit of the amplitude limit is the same as the current vertical amplitude unit. See the Add Point submenu key description for more details.</p> <p><b>Add Point:</b> The precise behavior of this submenu key depends on which limit point is active at the time the key is pressed. If the active limit point is somewhere in the middle of a multi-segment limit line, a new limit point will be added that is halfway between the currently active point and the point immediately to its right. The amplitude of the point will be such that it falls on the limit line. For example, if there is a limit point at 2.0 GHz with an amplitude of <math>-30</math> dBm and the next point is 3.0 GHz with an amplitude of <math>-50</math> dBm, the added point will be at 2.5 GHz with an amplitude of <math>-40</math> dBm. The frequency and amplitude values of the new point can be adjusted as needed with the Frequency and Amplitude submenu keys. If the last limit point is active (assuming it is not at the right edge of the display) the new limit point will be placed at the right edge of the display at the same amplitude as the point immediately to its left. Points may not be added beyond the current sweep limits of the instrument.</p> <p><b>Delete Point:</b> This submenu key deletes the currently active point. The active point becomes the one immediately to the left of the point that was deleted.</p> <p><b>Next Point Left:</b> This submenu key selects the limit point immediately to the left of the active point, making it active for editing or deletion. With each key press, the indicator of which point is active moves one limit point to the left until it reaches the left edge of the screen.</p> <p><b>Next Point Right:</b> This submenu key selects the limit point immediately to the right of the active point, making it active for editing or deletion. With each key press, the indicator of which point is active moves one limit point to the right until it reaches the right edge of the screen.</p> <p><b>Move Limit:</b> This submenu key allows an entire single or multi-segment limit line to be moved up or down by the number of dB entered using the keypad, the <b>Up/Down</b> arrow keys, or the rotary knob. The units for this amount will be the current display units as selected under the <b>Amplitude</b> menu.</p> <p><b>Back:</b> Returns to <a href="#">“Limit Menu” on page 2-29</a>.</p>
Frequency	
400 MHz	
Amplitude	
-4.0 dB	
Add	
Point	
Add	
Vertical	
Delete	
Point	
Next Point Left	
Next Point Right	
Back	

**Figure 2-28.** Limit Edit Menu

## 2-20 Application Options

Key Sequence: **Shift** > **System** (8) key > Application Options

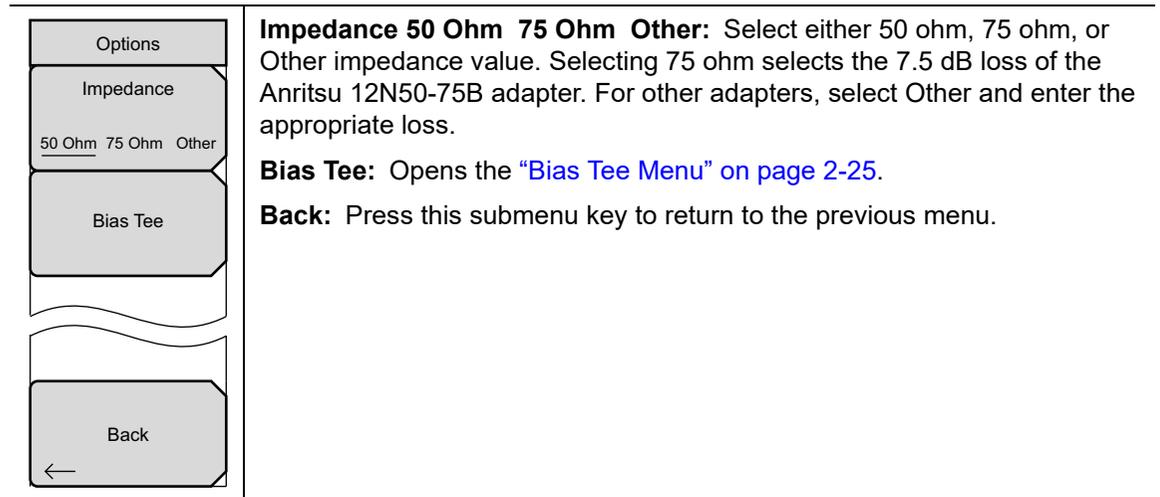


Figure 2-29. Application Options

## 2-21 Other Menus

**Preset**, **File**, **Mode** and **System** are described in the User Guide.



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490 Jarvis Drive  
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USA  
<http://www.anritsu.com>