

## Measurement Guide

# Spectrum Analyzer for Anritsu RF and Microwave Handheld Instruments

**BTS Master™**  
**Site Master™**  
**Spectrum Master™**  
**Cell Master™**  
**VNA Master™**

<b>Spectrum Analyzer</b>	<b>Included</b>
<b>Preamplifier</b>	<b>Option 8</b>
<b>Interference Analyzer</b>	<b>Option 25</b>
<b>Channel Scanner</b>	<b>Option 27</b>
<b>Zero-Span IF Output</b>	<b>Option 89</b>
<b>Gated Sweep</b>	<b>Option 90</b>
<b>CW Generator</b>	<b>Option 28</b>
<b>Coverage Mapping</b>	<b>Option 431</b>
<b>AM/FM/PM Analyzer</b>	<b>Option 509</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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## Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Company uses the following symbols to indicate safety-related information. For your own safety, please read the information carefully *before* operating the equipment.

### Symbols Used in Manuals

#### Danger



This indicates a very dangerous procedure that could result in serious injury or death, or loss related to equipment malfunction, if not performed properly.

#### Warning



This indicates a hazardous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

#### Caution



This indicates a hazardous procedure that could result in loss related to equipment malfunction if proper precautions are not taken.

### Safety Symbols Used on Equipment and in Manuals

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all of the following five symbols may or may not be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.



This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

## For Safety

### Warning



Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced. Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

### Warning



or



When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

### Warning



This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

### Caution



Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

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# Chapter 1 — General Information

## 1-1 Introduction

This Measurement Guide documents spectrum analysis, interference analysis, channel scanner function, Zero-Span IF Output, Gated Sweep, Coverage Mapping, CW Generator and AM/FM/PM analysis for Anritsu handheld instruments:

<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 Selecting a Measurement Mode

Press **Shift** and then the **Mode** (9) button to open the Mode Selector dialog box. Highlight the desired measurement mode and press **Enter**. Some Anritsu handheld instruments also have a **Menu** button which also displays icons of installed measurement modes. Refer to the instrument User Guide for additional information.



# Chapter 2 — Spectrum Analyzer

## 2-1 Introduction

Spectrum analyzer measurements include the use of additional functions beyond frequency, span, amplitude, and marker functions. [Section 2-2](#) and [Section 2-3](#) explain setup procedures and settings for making spectrum analyzer measurements. [Section 2-4](#) through [Section 2-9](#) focus on resolution bandwidth, video bandwidth, sweep, and attenuator functions. [Section 2-10](#) through [Section 2-19](#) cover field measurements including brief examples demonstrating field strength, occupied bandwidth, channel power, adjacent channel power ratio, and carrier to interference ratio (C/I) tests. Finally, [Section 2-21](#) through [Section 2-33](#) detail the submenus available in Spectrum Analyzer mode.

## 2-2 General Measurement Setups

Please refer to your instrument User Guide for setting up frequency, span, amplitude, GPS, limit lines, markers, and file management.

### Note

In most cases, information and parameters can be entered through the keypad, the directional arrows, or the rotary knob. The numerical keypad enters the information directly. The up and down arrow keys change a frequency parameter by the value entered through the Freq Step submenu key (default value is 1 MHz). The left and right arrow keys change the frequency parameter by one graticule, that is, one-tenth of the total span. The rotary knob changes the frequency parameter by one pixel per step. The screen has 551 pixels across its width. Choose whichever method is most convenient to enter the required information.

## 2-3 Making Spectrum Analyzer Measurements

### Required Equipment

- Optionally, an antenna that is appropriate for the frequency range to be measured

### Required Setup

- Place the instrument in Spectrum Analyzer mode.
- Connect the input signal or antenna to the RF In test port.

### Setting Bandwidth Parameters

Both resolution bandwidth (RBW) and video bandwidth (VBW) can be coupled to the frequency span automatically or manually set. When set to Auto RBW, RBW adjusts automatically in proportion to the frequency span. The default ratio of the span width to the resolution bandwidth is 100:1, and can be changed as follows:

1. Press the **BW** main menu key.
2. Press the **Span/RBW** submenu key. The current Span/RBW ratio is shown as part of the submenu key label. Change the value using the keypad, the directional arrows, or the rotary knob and then press **Enter**.

When auto-coupling between the span and RBW is selected (the Auto RBW submenu key is toggled to “On”), this is indicated on the left side of the display with the RBW label and underneath it one to three digits followed by the frequency units; this represents the resolution bandwidth value. If manual RBW is selected (the Auto RBW submenu key is toggled “Off”), the label and value turn red and a “#” symbol is shown in front of the RBW label. Adjust resolution bandwidth independently of the span. If an unavailable resolution bandwidth is entered, then the instrument selects the next higher resolution bandwidth. If a value greater than the widest RBW is entered, then the widest RBW will be selected.

VBW can be set two ways – manually or by auto coupling. Auto coupling of the VBW links the video bandwidth to the resolution bandwidth, so that VBW varies in proportion to RBW. Auto coupling is indicated on the left side of the display with the VBW label and underneath it one to three digits and the frequency units; this represents the video bandwidth value. If manual VBW coupling is selected, the label and value turn red and the “#” symbol is shown in front of VBW on the left side of the display. Adjust video bandwidth independently of the RBW. If a non-existent video bandwidth is entered, then the instrument will select the next higher video bandwidth. If a value greater than the widest VBW is entered, then the widest VBW will be selected.

The ratio of the resolution bandwidth to the video bandwidth can be changed by pressing the **BW** main menu key, the **RBW/VBW** submenu key, and then using the keypad, the directional arrows, or the rotary knob to set the ratio. By default, the RBW/VBW ratio is set to 3. The current value of the ratio is shown as part of the submenu key label.

1. Press the **BW** main menu key.
2. Press the **RBW/VBW** submenu key. The current RBW/VBW ratio is shown as part of the submenu key label. Enter the desired value.

## Setting Sweep Parameters

To set the sweep parameters, press the **Shift** key and then the **Sweep** (3) key.

### Single/Continuous

When this submenu key is pressed, the instrument toggles between single sweep and continuous sweep. In single sweep mode, after the sweep the instrument waits in Hold mode until the Manual Trigger submenu key is pressed or another triggering mode is selected.

### Sweep Mode

Several sweep modes are available on the instrument. Press the Sweep Mode submenu keys to select between **Fast** (default), **Performance** or **No FFT**. The Show Help submenu key displays a table detailing the trade-off between sweep speed and performance of the sweep mode options.

<b>Note</b>	Sweep Mode menu functionality varies based on instrument model.
	Fast is the default sweep mode for instruments that have received the new instrument calibration from Anritsu.

### Trigger Type

To select a specific type of triggering, press the Triggering submenu key followed by the Source submenu key. Selections are:

**Free Run:** The default trigger type is “Free Run” in which the instrument begins another sweep as soon as one is finished.

**External:** A TTL signal applied to the External Trigger BNC input connector causes a single sweep to occur. This mode is used in zero span, and triggering occurs on the rising edge of the signal. After the sweep is complete, the resultant trace is displayed until the next trigger signal arrives.

**Video:** This mode is used in zero span to set the power level at which a sweep is initiated. The power level can be set from  $-130$  dBm to  $+30$  dBm. Trigger is based on the measured signal level. The sweep triggers when the signal level crosses the trigger level with a positive slope. If no signal crosses the trigger level, the last trace on the screen, before video triggering was selected, will be displayed. To change the video triggering level use the rotary knob, enter the desired amplitude with the keypad, or use the **Left/Right** arrows to change the setting by 1 dB or the **Up/Down** arrows to change the setting by 10 dB.

**Gated Sweep Setup** (Option 90 Only): The Gated Sweep function allows the user to view the spectrum of a signal that has been gated in time. This is useful for measuring signals that are bursty in the time domain (pulsed RF, time multiplexed, burst modulated, etc.). Pressing the Gated Sweep Setup submenu key toggles the instrument to a dual graph view that displays the spectrum of the signal in the top graph and the time domain/zero span view of the same signal in the bottom graph. This allows the user to setup the gate length and gate delay using the zero span view in the bottom graph while simultaneously viewing the spectrum in the top graph. The Gate View Settings button shows a submenu that allows the user to independently set the RBW, VBW and sweep time for the zero span view. The “gate” is visually displayed as a blue dashed rectangle (Figure 2-1) and is controlled by the Gate Delay and Gate Length values. Once the gate has been setup, the user can apply gating to the spectrum by setting Gated Sweep to On. Gating will continue to be applied to the spectrum when you press Back and access other measurements and functions of the spectrum analyzer until either: (1) Gated Sweep is explicitly set to Off or (2) the Span setting is changed to Zero Span mode.

**Note**

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

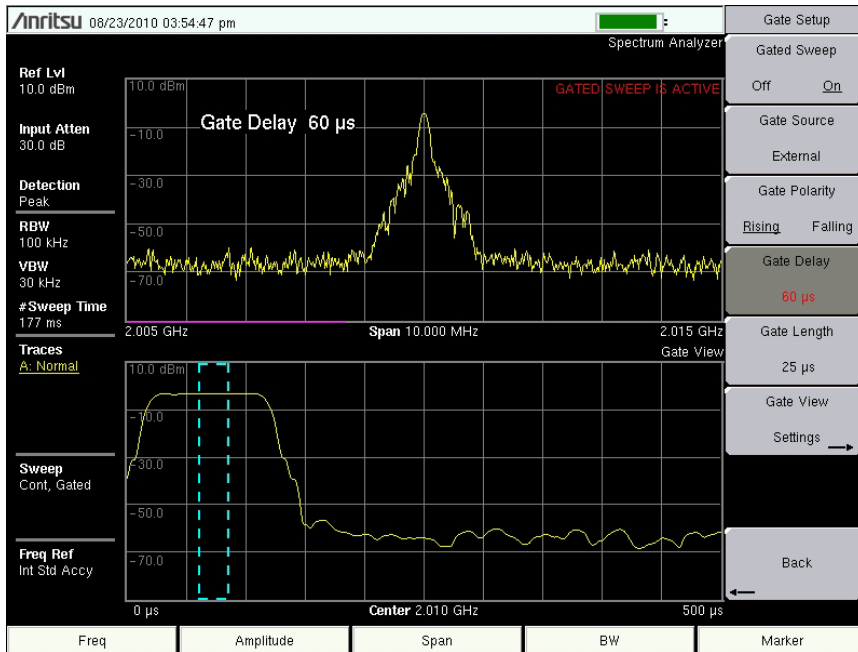


Figure 2-1. Gated Sweep Example

## 2-4 Resolution Bandwidth

Resolution Bandwidth (RBW) determines frequency selectivity. The spectrum analyzer traces the shape of the RBW filter as it tunes past a signal. The choice of resolution bandwidth depends on several factors. Filters take time to settle. The output of the filter will take some time to settle to the correct value, so that it can be measured. The narrower the filter bandwidth (resolution bandwidth) the longer the settling time needs to be, and therefore, the slower the sweep speed.

The choice of resolution bandwidth will depend upon the signal being measured. If two closely-spaced signals are to be measured individually, then a narrow bandwidth is required. If a wider bandwidth is used, then the energy of both signals will be included in the measurement. Thus, the wider bandwidth does not have the ability to look at frequencies selectively, but instead simultaneously measures all signals falling within the resolution bandwidth. Therefore, a broadband measurement would include all signals and noise within the measurement bandwidth into a single measurement.

On the other hand, a narrow-band measurement will separate the frequency components, resulting in a measurement that includes separate peaks for each signal. There are advantages to each. The ultimate decision will depend upon the type of measurement required.



There is always some amount of noise present in a measurement. Noise is often broadband in nature; that is, it exists at a broad range of frequencies. If the noise is included in the measurement, the measured value could be in error (too large) depending upon the noise level. With a wide bandwidth, more noise is included in the measurement. With a narrow bandwidth, less noise enters the resolution bandwidth filter, and the measurement is more accurate. If the resolution bandwidth is narrower, the noise floor will drop on the spectrum analyzer display. As the measured noise level drops, smaller signals that were previously obscured by the noise can now be measured.

## 2-5 Video Bandwidth

Spectrum analyzers typically use another type of filtering after the detector called video filtering. This filter also affects the noise on the display but in a different manner than the resolution bandwidth. In video filtering, the average level of the noise remains the same, but the variation in the noise is reduced. Hence, the effect of video filtering is a “smoothing” of the signal noise. The resultant effect on the analyzer’s display is that the noise floor compresses into a thinner trace, while the average position of the trace remains the same.

Changing the video bandwidth (VBW) does not improve sensitivity, but it does improve discernability and repeatability when making low-level measurements. As a general rule of thumb, most field spectrum analyzer measurements are made at a video bandwidth that is a factor of 10 to 100 less than the resolution bandwidth. This ratio can be specified in the **BW** main menu. Using this ratio, with a resolution bandwidth of 30 kHz, typically, the video bandwidth is set between 300 Hz to 3 kHz, although it can be set anywhere from 1 Hz to 10 MHz.

## 2-6 Sweep Limitations

With some spectrum analyzers, the user has control over sweep time (the elapsed time of each sweep, sometimes called scan time). An analyzer cannot be swept arbitrarily fast while maintaining its specified accuracy, but will have a sweep rate limitation depending upon the resolution bandwidth, video bandwidth, and frequency range selected. The sweep rate is not usually chosen by the user but is determined by the frequency range swept divided by the sweep time. The limitation on sweep rate comes from the settling or response time of the resolution and video bandwidth filters. If an analyzer is swept too quickly, the filters do not have time to respond, and the measurement is inaccurate. Under such conditions, the analyzer display tends to have a “smeared” look to it, with the spectral lines being wider than normal and shifted to the right and at a lower amplitude than is correct.

Fortunately, the Anritsu products are designed to relieve the user from having to calculate the sweep speed or experiment to discover a sweep speed that yields accurate results. When changing the RBW and VBW, the sweep speed automatically changes to the fastest sweep speed that will yield accurate results. The sweep speed will be faster for a wide RBW or VBW and slower for a narrow RBW or VBW. The sweep speed can also be changed manually, by pressing the **Sweep** key and selecting the **Sweep Time** submenu key. Enter a sweep time from 10  $\mu$ s to 600 seconds. If the minimum sweep time entered by the user is less than the value needed to assure accurate results, the value that delivers accurate results will be used. Regardless of the minimum sweep time setting, the instrument will never sweep faster than the RBW and VBW settings will allow. The instrument is designed to ensure that no uncalibrated measurement conditions will occur.

## 2-7 Attenuator Functions

The Spectrum Analyzer includes a step attenuator at the RF input. This attenuator is used to reduce large signals to levels that make best use of the analyzer's dynamic range. Normally, the input attenuation automatically adjusts as a function of Reference Level. In the **Amplitude** menu, the **Attn Lvl** submenu allows manual setting of the attenuator. In **Auto Atten** mode, as the reference level is increased, the attenuation is increased. In **Manual** mode, the input attenuation can be adjusted using the keypad, the **Up/Down** arrow keys, or the rotary knob.

## 2-8 Detection

Several detection methods tailor the performance of the instrument to meet specific measurement requirements. In general, there are several measurement points for each display point. The various detection methods are different ways of dealing with how measurement point data is shown at each display point.

**Peak:** This method causes the largest measurement point to be shown for each display point, and assures that a narrow peak is not missed.

**RMS:** This method performs a root-mean-square calculation of all the measurement points in each display point, and is particularly useful in displaying the average value of noise or noise-like signals.

**Negative:** This method causes the smallest measurement point to be shown for each display point. Typically this mode is used to help detect small discrete signals in the presence of nearly equal values of noise. The display points that contain only noise will tend to show lower amplitudes than those that contain discrete signals.

**Sample:** This is the fastest detection method because for each display point, only one frequency point is measured. Use this method when speed is of paramount importance and the possibility of missing a narrow peak is not important.

**Quasi-peak:** When this selection is made resolution bandwidths and video bandwidths of 200 Hz, 9 kHz and 120 kHz are available. This detection method is designed to meet CISPR requirements.

## 2-9 Preamplifier Operation (Option 8)

The preamplifier can be turned on and off by pressing the **Amplitude** main menu key, then selecting the **Preamp On/Off** submenu key. The Preamplifier option is standard in most Anritsu instruments and is available in other instruments as Option 8.

### Preamplifier Measurement Example

[Figure 2-2](#) and [Figure 2-3](#) show the same signal with the preamplifier off and then on. Notice that when the preamplifier is turned on, the noise floor drops significantly allowing spectral regrowth components that were lost in the noise without the preamplifier to become easily visible.

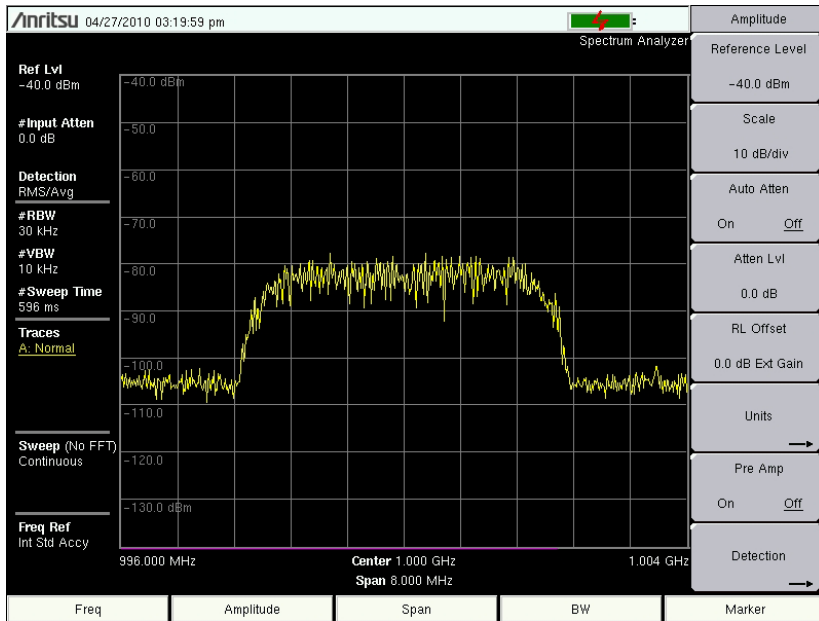


Figure 2-2. Preamplifier Off

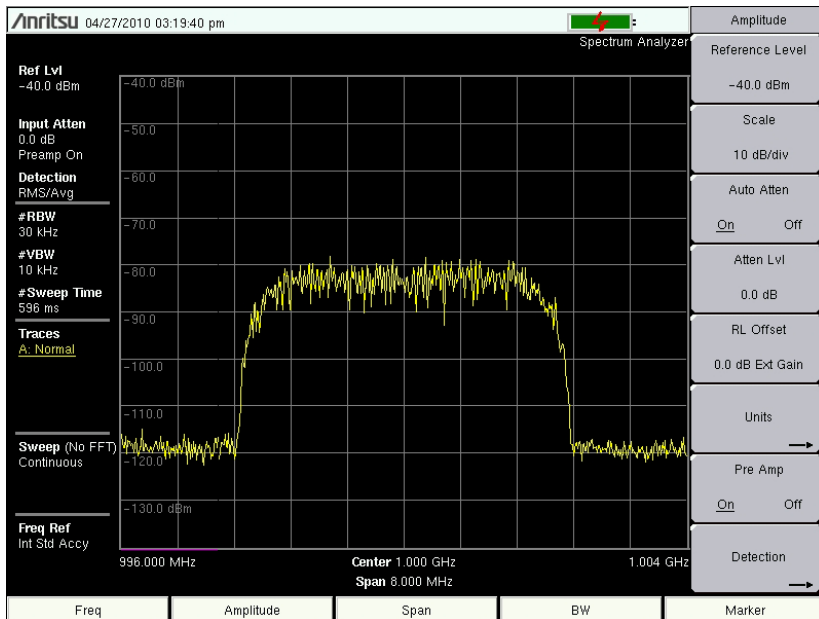


Figure 2-3. Preamplifier On

## 2-10 Field Measurements

In Spectrum Analyzer mode, smart one-button measurements are built-in for field strength, occupied bandwidth, channel power, adjacent channel power ratio, and carrier to interference ratio (C/I) tests. In addition, AM/FM/SSB demodulation is available to aid in the identification of interfering signals. This section presents brief examples demonstrating the use of these measurements.

## 2-11 Field Strength

### Required Equipment

Portable Antenna for which antenna factors or antenna gain and bandwidth data are available.

### Procedure

1. Press the **Shift** key then the **Measure** key. Press the Field Strength submenu key followed by pressing the On/Off submenu key so that On is underlined.
2. Press the Antenna submenu key and use the **Up/Down** arrow keys or the rotary knob to select the desired antenna. Press the **Enter** key to select.

<b>Note</b>	Select an antenna from the standard list available or use the Antenna Editor feature of Anritsu Master Software Tools to define a custom antenna and upload the antenna information to the antenna list.
-------------	--

3. Connect the antenna to the RF In port.
4. Press the **Freq** main menu key, press the Center Freq submenu key, and enter the center frequency.
5. Press the **Span** main menu key. Set the span wide enough to include the primary channel bandwidth and upper and lower channel bandwidths. At least a portion of the span has to include a frequency within the antenna's specified range.
6. Press the **BW** main menu key and verify that Auto RBW and Auto VBW are On.
7. To change the units of measurement, press the **Amplitude** main menu key, then press the Units submenu key and press dBm/m<sup>2</sup>, dBV/m, dBmV/m, dBμV/m, Volt/m, or Watt/m<sup>2</sup>. The instrument automatically adjusts the measurement by the antenna factors selected. Marker values will be displayed in the same units as selected for amplitude.

## Antenna Calculations

The following is a list of various antenna calculations should you find it necessary to convert from one parameter to another:

### Conversion of signal levels from watts to volts in a 50 ohm system:

$$P = V^2/R$$

where:

P = power in Watts

V = voltage level in Volts

R = resistance in ohms

Note that  $1\text{mW} = 10^{-3}\text{ W}$  and  $1\mu\text{V} = 10^{-6}\text{ V}$ .

For power in dBm, and voltage in dB ( $\mu\text{V}$ ):

$$V_{\text{dB}(\mu\text{V})} = P_{\text{dBm}} + 107\text{ dB}$$

### Power density to field strength:

An alternate measure of field strength is power density:

$$P_d = E^2 / 120\pi$$

where:

E = field strength in V/m

$P_d$  = Power density in  $\text{W}/\text{m}^2$

### Power density at a point:

$$P_d = P_t G_t / (4\pi r^2)$$

This equation is only valid in the far field, where electric and magnetic fields are related by the characteristic impedance of free space:

where:

$P_d$  = power density in  $\text{W}/\text{m}^2$

$P_t$  = power transmitted in Watts

$G_t$  = gain of transmitting antenna

r = distance from the antenna in meters

## 2-12 Occupied Bandwidth Measurement

Occupied bandwidth (OBW) is a common measurement performed on radio transmitters. This measurement calculates the bandwidth containing the total integrated power occupied in a given signal bandwidth. There are two different methods of calculation depending upon the technique used to modulate the carrier.

- **% Integrated Power Method:** The occupied frequency bandwidth is calculated as the bandwidth containing the specified percentage of the transmitted power.
- **> dBc Method:** The occupied frequency bandwidth is defined as the bandwidth between the upper and lower frequency points at which the signal level is a desired number of dB below the peak carrier level.

### Required Equipment

- Test Port Extension Cable, Anritsu part number 15NNF50-1.5C
- 30 dB, 50 Watt, bi-directional, DC –18 GHz, N(m) – N(f), Attenuator, Anritsu 42N50A-30 (required if the power level being measured is > +30 dBm)

### Procedure

1. Using the test port extension cable and the 30 dB, 50 watt, bi-directional attenuator (if needed) connect the RF In port to the appropriate transmitter test port or signal source.
2. Press the **Freq** main menu key followed by the **Center Freq** submenu key and enter the center frequency using the keypad, the arrow keys, or the rotary knob. If entering a frequency using the keypad, the submenu key labels change to GHz, MHz, kHz, and Hz. Press the appropriate units key. Pressing the **Enter** key has the same affect as the MHz submenu key.
3. If an attenuator was connected in step 1, press the **Amplitude** main menu key then press the **RL Offset** submenu key, enter 30 then select **dB External Loss** to compensate for the loss in the attenuator.
4. Press the **Amplitude** main menu key then press the **Reference Level** submenu key to set the appropriate reference level.
5. Press the **Atten Lvl** submenu key to set the input attenuation level or leave **Auto Atten** set to **On**.
6. Press the **BW** main menu key to set the resolution bandwidth and video bandwidth if desired.
7. Press the **Shift** key then the **Measure** (4) key followed by the **OCC BW** submenu key. Choose the measurement method (**% Int Pwr** or **> dBc**) by pressing the **Method** submenu key. The selected method is underlined.
8. Press the **dBc** or **%** submenu keys to adjust the settings as needed. Common values are 99% and 30 dBc.
9. Press the **On/Off** submenu key to start the measurement. An information box will appear below the graph while occupied bandwidth measurement is on.

Figure 2-4 shows the occupied bandwidth results using the percent of power method on a WCDMA signal. Occupied Bandwidth is a constant measurement; after it is turned on, it remains on until it is turned off by pressing the On/Off submenu key again. Occupied bandwidth is calculated at the end of each sweep.

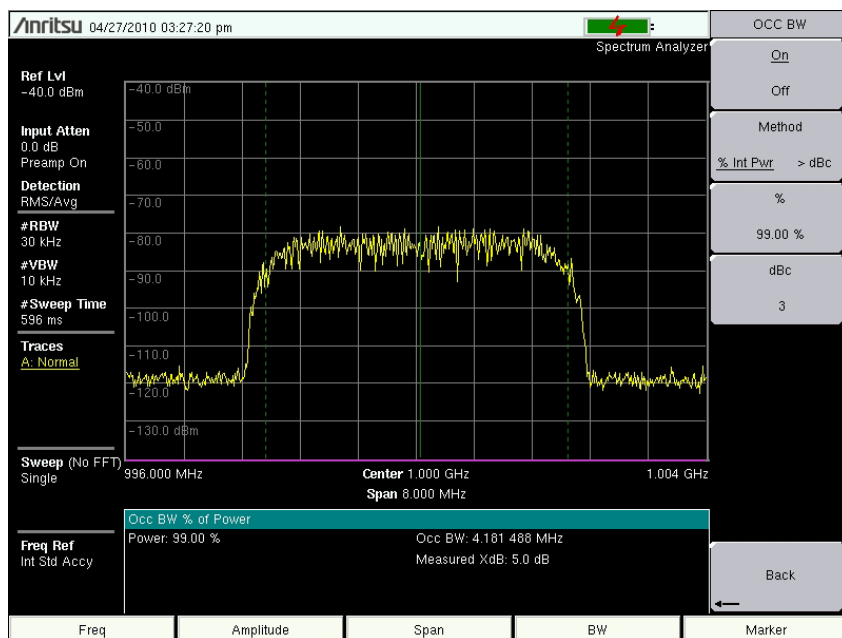


Figure 2-4. Occupied Bandwidth Results Using the % of Power Method

## 2-13 Channel Power Measurement

Channel power measurement is one of most common measurements for a radio transmitter. This test measures the output power, or channel power, of a transmitter over the frequency range. Out-of-specification power measurements indicate system faults, which can be in the power amplifiers or in filter circuits. Channel Power measurements can be used to validate transmitter performance, comply with government regulations, or to keep overall system interference at a minimum.

Frequency and span settings for many signal standards can be set.

1. Press the **Freq** main menu key.
2. Press the Signal Standard submenu key. Choose the desired standard and press **Enter**.
3. Press the Channel # submenu key to enter the channel number at which the measurement is to take place and press **Enter**.
4. Under the **Measure** menu, press the Channel Power submenu key.
5. Press the On/Off submenu key to start and stop channel power measurements.

## Channel Power Measurement for GSM

Global Systems for Mobile (GSM) communication is a globally accepted standard for digital cellular communication. There are a number of frequency bands allocated to GSM mobile phones that use a combination of Frequency Division Multiple Access (FDMA) and Time Division Multiple Access (TDMA). Within each band are approximately one hundred available carrier frequencies on 200 kHz spacing (FDMA), and each carrier is broken up into time-slots so as to support eight separate conversations (TDMA). GSM uses the Gaussian Minimum Shift Keying (GMSK) modulation method.

### Required Equipment

- Test Port extension cable, Anritsu 15NNF50-1.5C

### Procedure

1. Using the test port extension cable, connect the signal source to the RF In test port.
2. Press the **Amplitude** main menu key and press the **Reference Level** submenu key to set the reference level to  $-20$  dBm. Adjust the values given in this procedure to match your measurement conditions.
3. Press the **Scale** submenu key and set the scale to 10 dB/div.
4. Press the **BW** main menu key and verify that Auto RBW and Auto VBW are On.
5. Press the **Freq** main menu key followed by the **Signal Standard** submenu key. Scroll through the dialog box using the rotary knob or **Up/Down** arrow keys to highlight the GSM 900 - Downlink standard for the measurement and press **Enter**.
6. Press the **Channel#** submenu key and enter the channel number using the keypad, the arrow keys, or the rotary knob. For this example, select Channel 60.
7. Press the **Shift** key then the **Measure** (4) key and press the **Channel Power** submenu key.
8. Press the **Center Freq** submenu key and verify that the center frequency is set to that of the GSM signal, in this case 947.0 MHz.
9. Press the **Ch Pwr Width** submenu key and enter 200 kHz for the integration bandwidth, or set the integration bandwidth appropriate for the particular application.
10. Press the **Span** submenu key and enter 600 kHz as the channel span, or set the channel span to a value appropriate for the particular application.
11. Make the measurement by pressing the **Measure** (4) key, press the **Channel Power** submenu key, then press **On**. The measurement results are displayed in the message area.

**Note**

Channel Power is a constant measurement. After it is turned on, it will remain on until it is turned off by pressing the On/Off submenu key again.



## 2-14 Adjacent Channel Power Measurement

### Required Equipment

- 30 dB, 50 watt, Bi-Directional, DC–18 GHz, N(m)–N(f) Attenuator, Anritsu Part Number 42N50A-30 (if required for the power level being measured)
- Test Port extension cable, Anritsu Part Number 15NNF50-1.5C

### Procedure

1. Using the test port extension cable and 30 dB attenuator, connect the signal source to the input of the attenuator, and connect the output of the attenuator to the RF In test port.
2. If an attenuator was connected in step 1, press the **Amplitude** main menu key then press the RL Offset submenu key, enter 30 then select dB External Loss to compensate for the loss in the attenuator.
3. Press the **Amplitude** main menu key and press the Reference Level submenu key to set the reference level to 60 dBm.
4. Press the Atten Lvl submenu key to set the input attenuation level needed for the measurement. This value depends on the input power level and any external attenuator. Enter an attenuation level to achieve roughly –40 dBm at the input mixer.
5. Press the **BW** main menu key and verify that Auto RBW and Auto VBW are On.
6. There are two ways to set the measurement parameters. If the signal standard and channel are known, press the **Freq** main menu key and set the signal standard and press Channel submenu key for the signal to be measured, then skip to 12. If the signal standard and channel are not known, follow the procedure in steps 7 through 11.
7. Press the **Freq** main menu key, press the Center Freq submenu key, and enter the desired center frequency.
8. Press the **Shift** key then the **Measure** (4) key and press the ACPR submenu key.
9. Press the Main Ch BW submenu key, and enter the main channel bandwidth.
10. Press the Adj Ch BW submenu key, and enter the adjacent channel bandwidth.
11. Press the Ch Spacing submenu key, and enter the channel spacing.
12. Make the measurement by pressing the On/Off submenu key. The detection method is automatically changed to RMS Average.

Solid vertical lines are drawn on the display to indicate the main channel. Dashed vertical lines define the adjacent channels. The SPA will display the measurement results in the message area.

**Note**

Adjacent Channel Power Ratio is a constant measurement. After it is turned on, it will remain on until it is turned off by pressing the On/Off submenu key again.

## 2-15 Out-of-Band Spurious Emission Measurement

### Required Equipment

- Test Port extension cable, Anritsu 15NNF50-1.5C

### Procedure

1. Using the test port extension cable, connect the signal source to the RF In test port.
2. Press the **Freq** main menu key, press the Center Freq submenu key, and enter the center frequency.
3. Press the **Span** main menu key. Set the span wide enough to include the primary channel bandwidth and upper and lower channel bandwidths.
4. Press the **Amplitude** main menu key, then press the Reference Level submenu key and set the reference level to  $-20$  dBm.
5. Press the Auto Atten submenu key set the attenuation to On.
6. Press the **BW** main menu key, then use the RBW and VBW submenu keys to set the resolution bandwidth to 3 kHz and the video bandwidth to 300 Hz.
7. Press the **Marker** main menu key and press the Marker 123456 submenu key to select marker 1. The underlined number indicates the active marker.
8. Press the On/Off submenu key to activate the marker. Use the arrow keys, the keypad and the knob to move the marker over one of the spurs. To use the corresponding delta marker, press the Delta submenu key so that On is underlined. Use the arrow keys or rotary knob to move the delta marker to the desired frequency and press **Enter**.
9. Compare the value of the marker to the specified allowable level of out-of-band spurious emissions for the corresponding channel transmit frequency.

10. Repeat steps 8 and 9 for the remaining spurs. Use either Marker 1 again, or choose another marker. [Figure 2-5](#) shows a simulated out-of-band spurious signal 3 MHz from the carrier using a delta marker.

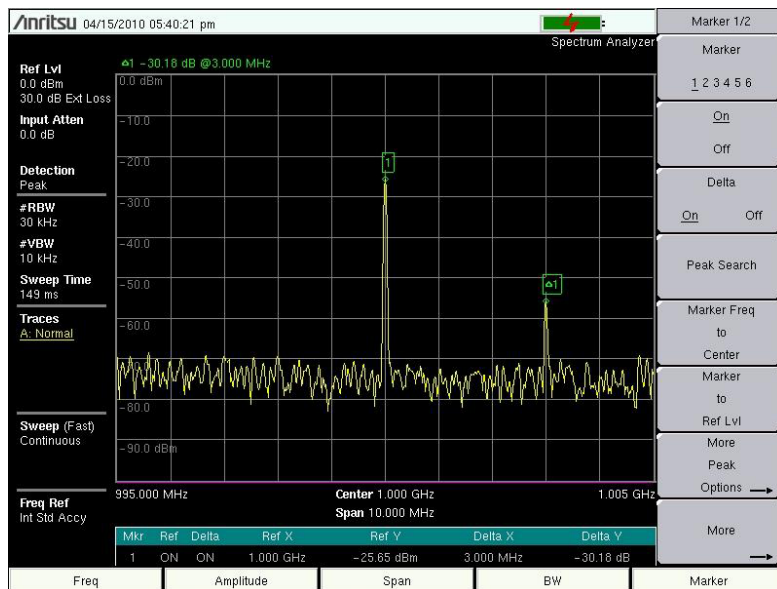


Figure 2-5. Out-of-Band Spurious Emission Measurement

## 2-16 In-band/Out-of-Channel Measurements

The in-band/out-of-channel measurements are those measurements that measure distortion and interference within the system band, but outside of the transmitting channel. These measurements include in-band spurious emissions and adjacent channel power ratio (also called spectral regrowth). There are stringent regulatory controls on the amount of interference that a transmitter can spill to neighboring channels. In order to determine compliance with the allowable level of spurious emissions, two parameters need to be specified:

- Measurement channel bandwidth
- Allowable level of spurious emissions

## 2-17 In-band Spurious Measurement

### Required Equipment

- 30 dB, 50 watt, Bi-Directional, DC–18 GHz, N(m)–N(f), Attenuator, Anritsu 42N50A-30
- Test Port extension cable, Anritsu 15NNF50-1.5C

### Procedure

1. Using the test port extension cable and 30 dB, 50 watt, (Bi-directional) attenuator, connect the RF In port to the appropriate transmit test port.
2. Press the **Freq** main menu key, press the **Center Freq** submenu key, and enter the center frequency.
3. Press the **Span** main menu key. Set the span wide enough to include the primary channel bandwidth and upper and lower channel bandwidths.
4. Press the **Amplitude** main menu key and then press the **Reference Level** submenu key to set the reference level to  $-20$  dBm.
5. Press the **RL Offset** submenu key, enter 30 then select **dB External Loss** to compensate for the loss in the attenuator.
6. Press the **Auto Atten** submenu key and set the attenuation to **On**.
7. Press the **BW** main menu key and use the **RBW** and **VBW** submenu keys to set the resolution bandwidth to 10 kHz and the video bandwidth to 300 Hz.
8. Press the **Marker** main menu key and press the **Marker 123456** submenu key to select **Marker 1**. The underlined number indicates the active marker.
9. Press the **On/Off** submenu key and use the arrow keys, the keypad and the knob to move the marker over one of the spurs.
10. Compare the value of the marker to the specified allowable level of in-band/out-of-channel spurious emissions for the corresponding channel transmit frequency.
11. Repeat steps 9 and 10 for the remaining spurs. Use either **Marker 1** again, or choose another marker.

## 2-18 AM/FM/SSB Demodulation

The built-in demodulator for AM, narrowband FM, wideband FM and single sideband (selectable USB and LSB) allows a technician to hear an interfering signal. The demodulated signal can be heard using either the built-in speaker, or through a monaural headset connected to the 2.5mm jack on the connector panel.

### Procedure

1. Press the **Shift** key followed by the **Measure** (4) key and the AM/FM Demod submenu key.
2. Press the Demod Type submenu key and select FM Wide Band, FM Narrow Band, AM, USB, or LSB to match the modulation format of the signal.
3. Press the Back submenu key.
4. Press the Demod Freq submenu key and use the keypad or rotary knob to enter the center frequency of the signal to be demodulated. For USB and LSB signals, fine tune the signal by adjusting the Beat Freq Osc. By default the BFO frequency is set to zero, meaning that the re-injected carrier is exactly at the demodulation frequency. The Beat Freq Osc submenu key allows adjustment of the beat frequency oscillator to fine tune the signal through a span of  $\pm 10000$  Hz.
5. Press the On/Off submenu key to enable the measurement.
6. Press the Volume submenu key and use the **Up/Down** arrow keys or rotary knob to change the audio volume from 0% to 100%. For most headsets a volume of 40% is adequate.
7. The Demod Time submenu key sets the time the unit will demodulate the signal. Enter a value from 100 ms to 500 seconds.

## 2-19 Carrier to Interference Ratio Measurement

Carrier to Interference Ratio (C/I) Measurement is a two-step process, first measuring the carrier level and then, with the carrier turned off, measuring the remaining signals and noise in the band of interest. After the two measurements are complete, the ratio of the carrier level to the noise plus interference is displayed using three assumptions:

- The interferer is a narrowband frequency hopping signal (NB FHSS)
- The interferer is a wideband frequency hopping signal (WB FHSS)
- The interferer is a broadband signal (BB).

The primary application for this type of measurement is determining the magnitude of interference problems for 802.11b, 802.11g and 802.11a access points (hot spots).

### Procedure

1. Press the **Freq** main menu key followed by the **Signal Standard** submenu key. Select the appropriate signal standard based on the signal to be measured and press **Enter**.
2. Press the **Channel** submenu key, select the operating channel of the access point being measured and press **Enter**.
3. Press the **Shift** key followed by the **Measure** (4) key and the **C/I** submenu key.
4. Press the **Center Freq** submenu key and enter the desired frequency, unless a Signal Standard and Channel have already been selected in the Frequency menu.
5. If needed, press the **Span** submenu key and set an appropriate span width for the signal to be measured.
6. If the signal environment includes slow frequency hopping signals, such as cordless telephones, press the **Min Sweep Time** submenu key to set a sweep time of one second or more to give a good chance of capturing instances of the interfering signal.
7. Press the **On/Off** submenu key and follow the on-screen prompts to complete the measurement.

<b>Note</b>	Access to the transmitter is required to complete this procedure as the transmitted carrier must be turned off for the second portion of the measurement.
-------------	---

8. After the measurement is complete, the measurement box gives results for the three different signal types. Some measurement results may show as **Error**, and this is to be expected.

The following figures show the C/I measurement steps: ready to measure the carrier (Figure 2-6), with the carrier measured (Figure 2-7), and the measurement results (Figure 2-8).

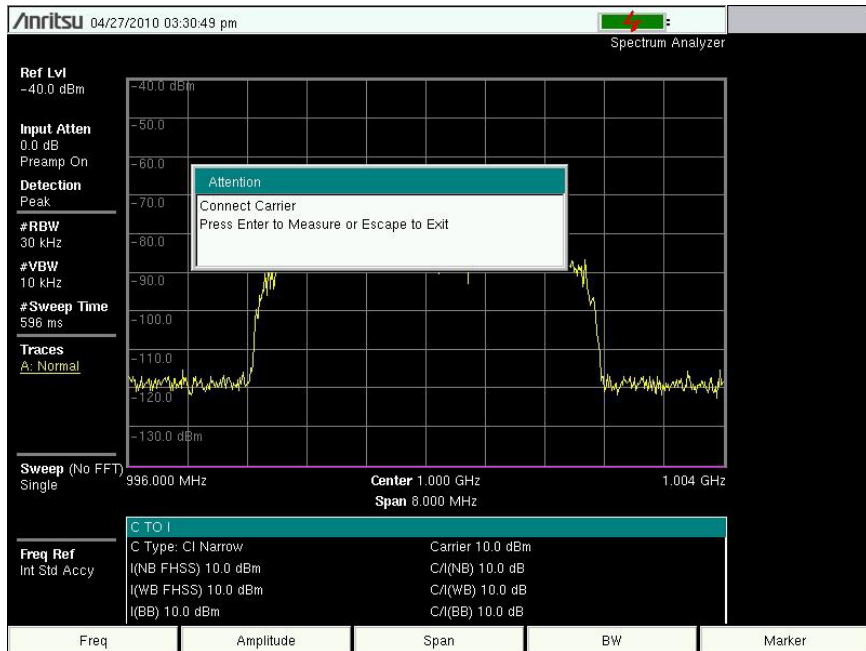


Figure 2-6. C/I Measurement, Ready to Measure the Carrier

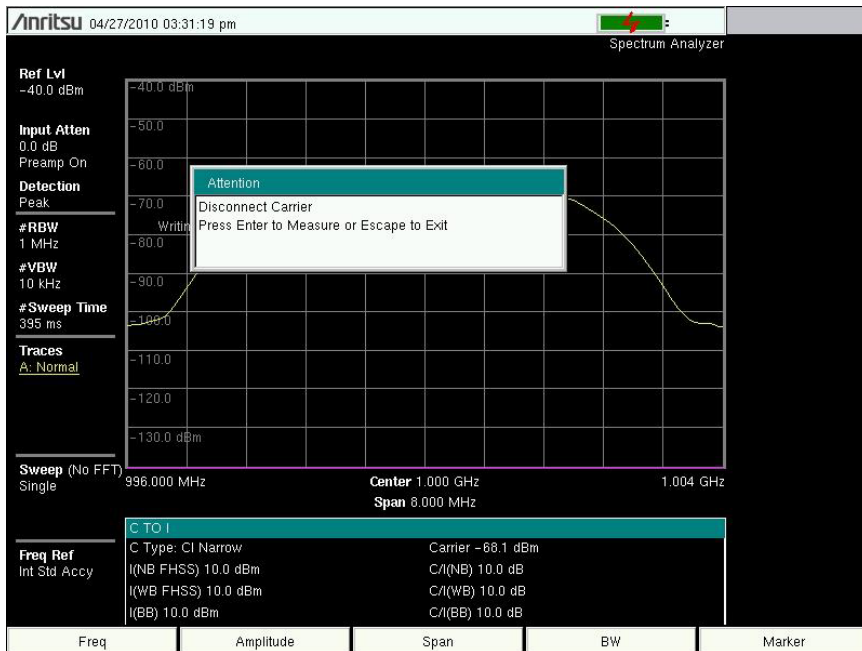


Figure 2-7. C/I Measurement, Carrier Measured

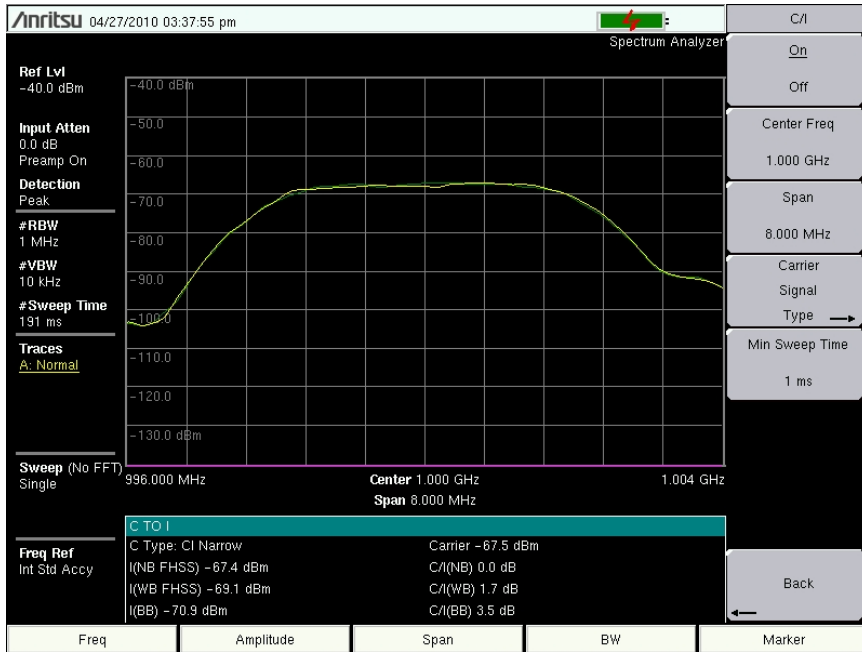


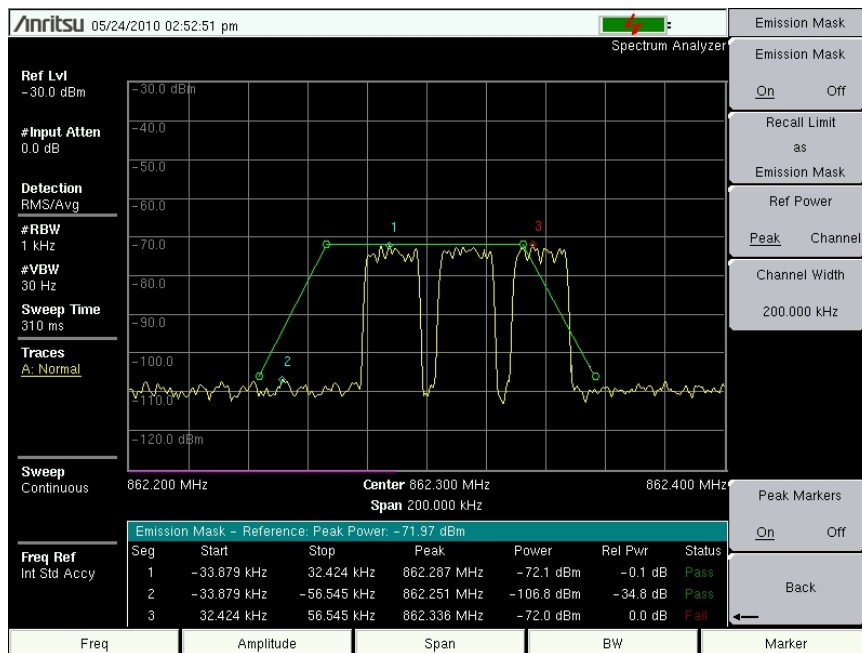
Figure 2-8. C/I Measurement, Results



## 2-20 Emission Mask

The emission mask is a segmented upper limit line that will display frequency range, peak power and frequency, relative power and pass/fail status for each segment of the mask. The emission mask must have at least two segments.

1. Create or recall a multi-segment limit line or envelope to use as an emission mask.  
Refer to [Section 2-31 “Limit Menu” on page 2-54](#) for details on the Limit menu.
2. Press the **Shift** key followed by the **Measure** (4) key and the More submenu key.
3. Press the Emission Mask submenu key and turn Emission Mask On.



**Figure 2-9.** Emission Mask

4. The table at the bottom of the screen displays the pass/fail status of each Emission Mask segment.

## 2-21 Spectrum Analyzer Menus

Figure 2-10 through Figure 2-15 show the map of the Spectrum Analyzer menus. The following sections describe Spectrum Analyzer main menu and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.

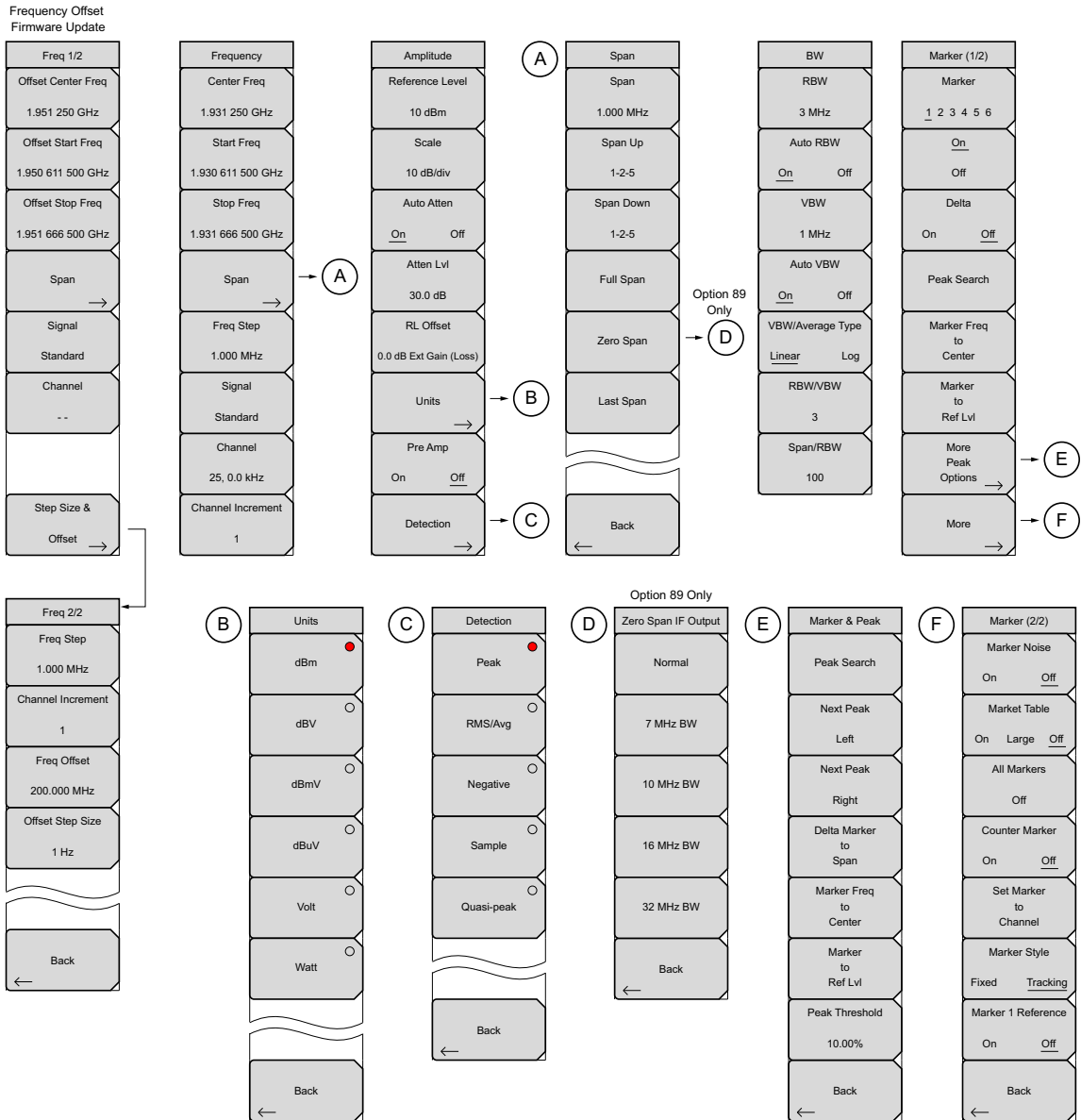


Figure 2-10. Main Menu Keys

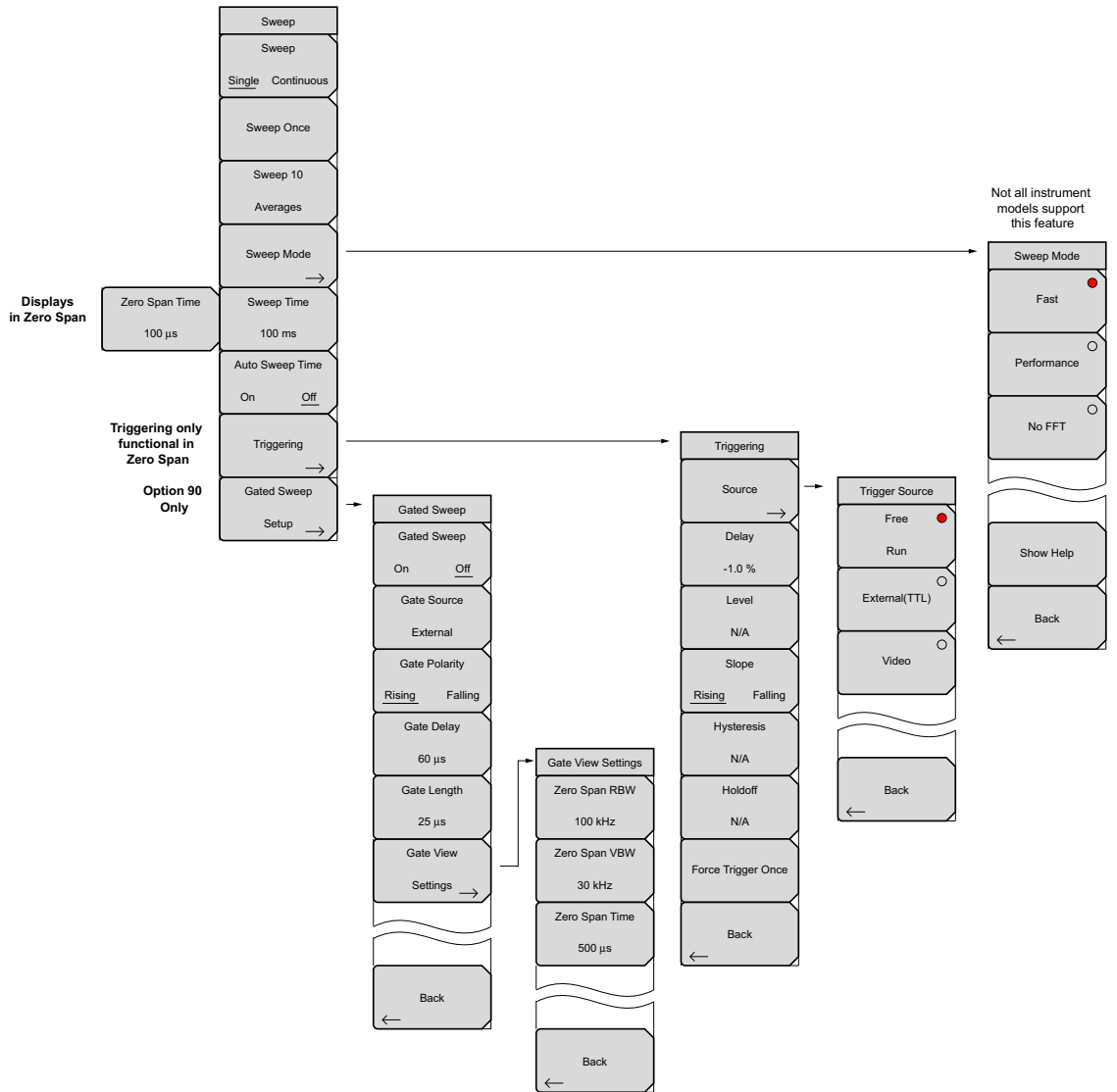


Figure 2-11. Sweep Submenu Keys

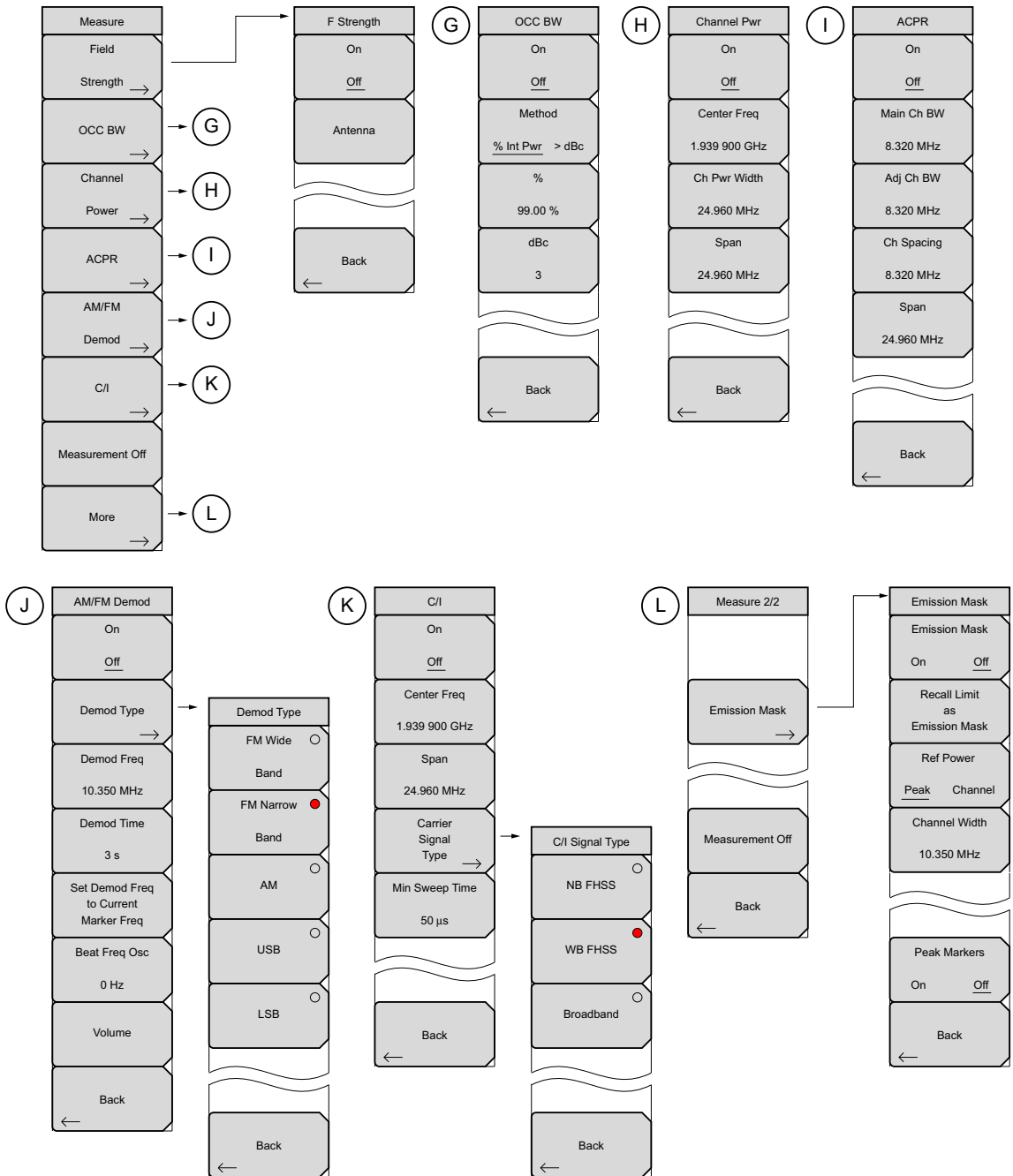


Figure 2-12. Measure Submenu Keys

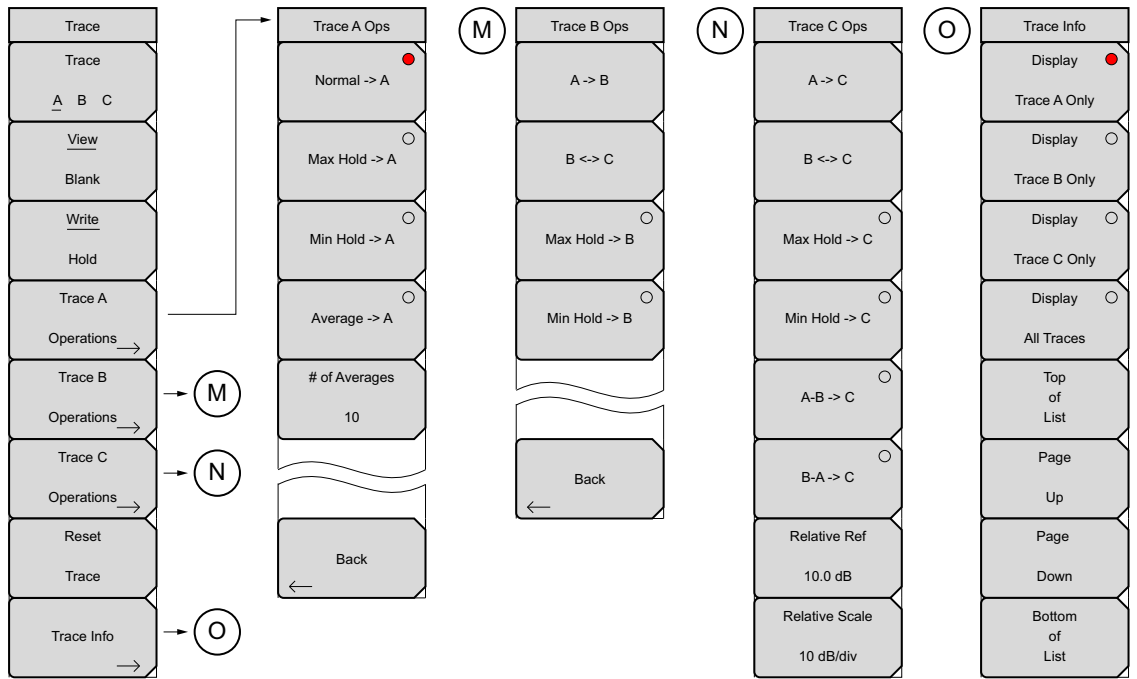


Figure 2-13. Trace Submenu Keys

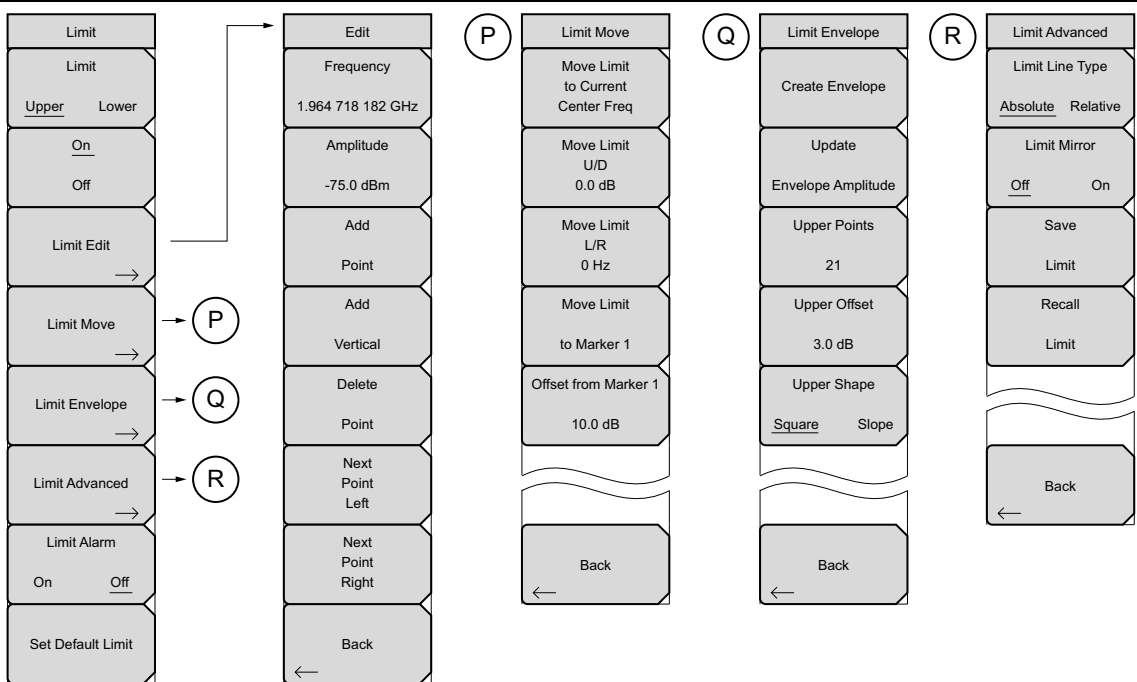


Figure 2-14. Limit Submenu Keys

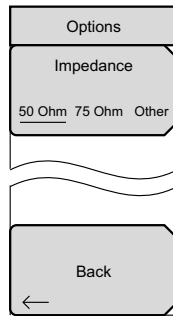


Figure 2-15. System Menu, Application Options Submenu Keys

## 2-22 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.

**Note**

Refer to [“Frequency Menu with Offset Function”](#) on page 2-29 if your instrument firmware supports frequency offset (bottom submenu is Step Size & Offset).

Frequency	<b>Center Freq:</b> Press the <b>Freq</b> main menu key followed by the Center Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If 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.
Center Freq 1.931 250 GHz	Note: When using the up and down arrows, the frequency moves in steps defined by the value entered using the Freq Step submenu key. When using the left or right arrow keys, the frequency of the active parameter moves by 10% of the current frequency span. If the instrument is in zero span, the left and right arrows do nothing. Turning the rotary knob changes the active frequency parameter in increments of one display point for each click of the knob. There are 551 display points across the screen.
Start Freq 1.930 611 500 GHz	<b>Start Freq:</b> Press the <b>Freq</b> main menu key followed by the Start Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a start frequency higher than the current stop frequency is entered, the stop frequency will be changed to yield a 10 Hz span.
Stop Freq 1.931 666 500 GHz	<b>Stop Freq:</b> Press the <b>Freq</b> main menu key followed by the Stop Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a stop frequency lower than the current start frequency is entered, the start frequency will be changed to yield a 10 Hz span.
Span →	<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 product will support. See the product specifications for the maximum frequency. Span can also be set to zero span.
Freq Step 1.000 MHz	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 1-2-5 steps for each key press. See <a href="#">“Span Menu”</a> on page 2-34.
Signal Standard	
Channel 25, 0.0 kHz	
Channel Increment 1	

**Figure 2-16.** SPA Frequency Menu (1 of 2)

## Freq (Frequency) Menu (Continued)

Frequency
Center Freq 1.931 250 GHz
Start Freq 1.930 611 500 GHz
Stop Freq 1.931 666 500 GHz
Span →
Freq Step 1.000 MHz
Signal Standard
Channel 25, 0.0 kHz
Channel Increment 1

**Freq Step:** Press the **Freq** main menu key followed by the Freq Step submenu key to enter the desired frequency step size. The frequency step specifies the amount by which a frequency will change when the **Up/Down** arrow keys are pressed. The center frequency, start frequency, and stop frequency values can be changed using Freq Step. The active parameter will be changed by the frequency step when the **Up/Down** arrow keys are pressed. The frequency step size can be any value from 1 Hz to upper limit of the instrument with a resolution of 1 Hz. The frequency step value can be used to change start frequency, stop frequency, center frequency, and the frequency step size.

Use the keypad or the rotary knob to change the Frequency Step size.

**Signal Standard:** Use the **Up/Down** arrow keys or the rotary knob to highlight a signal standard and press **Enter** to select.

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.

**Channel #:** Use the **Up/Down** 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. The frequency value is the amount by which the center frequency differs from the center of the channel.

**Channel Increment:** Sets the increment value for the Channel # submenu key.

Figure 2-17. SPA Frequency Menu (2 of 2)



## 2-23 Frequency Menu with Offset Function

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. A user defined frequency offset can be entered to adjust the frequency displayed on the instrument from the actual swept frequency. When enabled Offset will be displayed at the bottom of the screen ([Figure 2-20](#)) and the Center Freq, Start Freq, and Stop Freq keys will indicate that a frequency offset has been turned on.

Set the Freq Offset to 0 Hz to remove the frequency offset.

### Note

The Freq Offset will affect the displayed values of Frequencies, Markers and Limits. The currently frequency offset value is displayed in the [“Freq 2/2 Menu”](#).

Freq 1/2
(Offset) Center Freq 1.930 500 GHz
(Offset) Start Freq 1.830 500 GHz
(Offset) Stop Freq 2.030 500 GHz
Span →
Signal Standard
Channel --
Step Size & Offset →

**(Offset) Center Freq :** Press the **Freq** main menu key followed by the (Offset) Center Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If entering a frequency using the keypad, the submenu key labels change to GHz, MHz, kHz, and Hz. Press the appropriate units key. Pressing the **Enter** key has the same affect as the MHz submenu key.

**(Offset) Start Freq:** Press the **Freq** main menu key followed by the (Offset) Start Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a start frequency higher than the current stop frequency is entered, the stop frequency will be changed to yield a 10 Hz span.

**(Offset) Stop Freq:** Press the **Freq** main menu key followed by the (Offset) Stop Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a stop frequency lower than the current start frequency is entered, the start frequency will be changed to yield a 10 Hz span.

**Span:** Press the **Freq** main menu key followed by the Span submenu key and enter the desired span. See [“Span Menu” on page 2-34](#).

**Signal Standard:** Use the **Up/Down** arrow keys or the rotary knob to highlight a signal standard and press **Enter** to select.

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.

**Channel #:** Use the **Up/Down** 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. The frequency value is the amount by which the center frequency differs from the center of the channel.

**Step Size & Offset:** Opens the [“Freq 2/2 Menu” on page 2-30](#).

**Figure 2-18.** SPA Freq 1/2 with Offset Function Menu

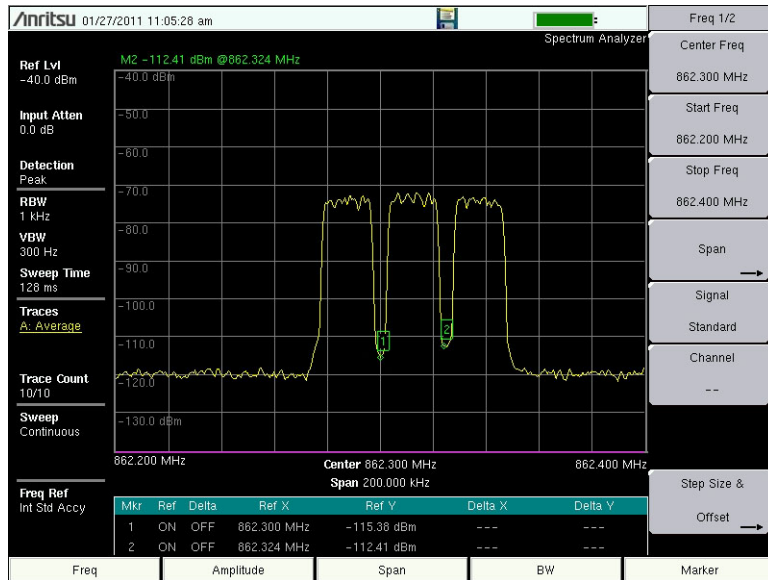
## Freq 2/2 Menu

Key Sequence: **Freq** > Step Size & Offset

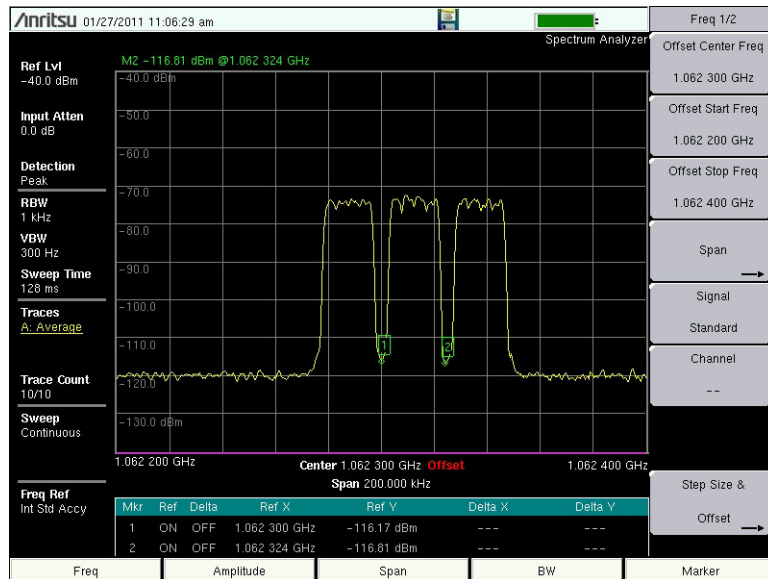
Freq 2/2	<p><b>Freq Step:</b> Press the <b>Freq</b> main menu key followed by the Freq Step submenu key to enter the desired frequency step size. The frequency step specifies the amount by which a frequency will change when the <b>Up/Down</b> arrow keys are pressed. The center frequency, start frequency, and stop frequency values can be changed using Freq Step. The active parameter will be changed by the frequency step when the <b>Up/Down</b> arrow keys are pressed. The frequency step size can be any value from 1 Hz to upper limit of the instrument with a resolution of 1 Hz. The frequency step value can be used to change start frequency, stop frequency, center frequency, and the frequency step size.</p> <p>Use the keypad or the rotary knob to change the Frequency Step size.</p> <p><b>Channel Increment:</b> Sets the increment value for the Channel # submenu key.</p> <p><b>Freq Offset:</b> Enter the desired offset (positive or negative) using the keypad, the arrow keys, or the rotary knob. If 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.</p> <p><b>Offset Step Size:</b> Enter the desired frequency offset step size. The offset frequency step specifies the amount by which the offset frequency will change when the <b>Up/Down</b> arrow keys are pressed.</p> <p>Use the keypad or the rotary knob to change the Offset Step Size.</p> <p><b>Back:</b> Returns to the <a href="#">“Frequency Menu with Offset Function”</a> on page 2-29.</p>
Freq Step 1.000 MHz	
Channel Increment 1	
Freq Offset 200.000 MHz	
Offset Step Size 1 Hz	
Back ←	

**Figure 2-19.** SPA Freq 2/2 Menu Offset Function

Example of Frequency Offset Using the Same Source Signal



No Offset



+200 MHz Frequency Offset  
(Freq > Step Size & Offset > Freq Offset)

Figure 2-20. 200 MHz Frequency Offset Example

## 2-24 Amplitude Menu

Key Sequence: **Amplitude**

Amplitude	<p><b>Reference Level:</b> The reference level is the top graticule line on the display, and can be set from +30 dBm to –150 dBm. A value may be entered from the keypad, use the <math>\pm</math> key for a minus sign. After entering the value press the dBm submenu key or the <b>Enter</b> key. The <b>Up/Down</b> arrow keys change the reference level in 10 dB steps, and the <b>Left/Right</b> arrow keys change the value by 1 dB. The rotary knob changes the value by 0.1 dB per click. The reference level value may be modified by the reference level offset value to compensate for an external attenuator or amplifier.</p> <p><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.</p> <p><b>Auto Atten On/Off:</b> Input attenuation can be either tied to the reference level (On) or manually selected (Off). When input attenuation is tied to the reference level, attenuation is increased as higher reference levels are selected to make sure the instrument input circuits are not saturated by large signals that are likely to be present when high reference levels are required.</p> <p><b>Atten Lvl:</b> Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.</p> <p><b>RL Offset xx dB Ext Gain/Loss:</b> RL Offset compensates for the presence of external input attenuation or gain. Enter a positive value to compensate for gain or loss and then press the appropriate submenu key (dB External Gain or dB External Loss). The new RL Offset value will be displayed on the button.</p> <p><b>Units:</b> Select the display units from this submenu key: dBm, dBV, dBmV, dB<math>\mu</math>V, Volt, or Watt Press the Back submenu key to return to the Amplitude menu.</p> <p><b>Pre Amp On/Off:</b> This submenu key turns the low-noise front-end preamplifier on or off. To assure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be less than –40 dBm.</p> <p><b>Detection:</b> Several detection methods tailor the performance of the instrument to meet specific measurement requirements. In general, there are more measurement points across the screen than display points. The various detection methods are different ways of dealing with how measurement point will be shown at each display point. Opens the <a href="#">“Detection Menu”</a> on page 2-33.</p>
Reference Level	
10 dBm	
Scale	
10 dB/div	
Auto Atten	
On      Off	
Atten Lvl	
30.0 dB	
RL Offset	
0.0 dB Ext Gain (Loss)	
Units	→
Pre Amp	
On      Off	
Detection	→

Figure 2-21. SPA Amplitude Menu

## Detection Menu

Key Sequence: **Amplitude** > Detection

Detection	<b>Peak:</b> This method causes the largest measurement point to be shown for each display point, assuring that a narrow peak is not missed.
Peak <input checked="" type="radio"/>	<b>RMS/Avg:</b> In the Preset case, when the VBW/Average Type is set to Linear, this method detects the average power of sample points that go into the display point. In the case where VBW/Average Type is set to Log, the traditional average of $\log(\text{power})$ is displayed for the detector, as well as for VBW and trace average.
RMS/Avg <input type="radio"/>	<b>Negative:</b> This method causes the smallest measurement point to be shown for each display point. Typically this mode is used to help detect small discrete signals in the presence of nearly equal values of noise. The display points that contain only noise will tend to show lower amplitudes than those that contain discrete signals.
Negative <input type="radio"/>	<b>Quasi-peak:</b> When this selection is made resolution bandwidths and video bandwidths of 200 Hz, 9 kHz and 120 kHz are available. This detection method is designed to meet CISPR requirements.
Sample <input type="radio"/>	<b>Sample:</b> This is the fastest detection method because for each display point, only one frequency point is measured. Use this method when speed is of paramount importance and the possibility of missing a narrow peak is not important.
Quasi-peak <input type="radio"/>	<b>Back:</b> Returns to the <a href="#">“Amplitude Menu” on page 2-32.</a>
Back	

**Figure 2-22.** SPA Detection Menu

## 2-25 Span Menu

Press the **Span** submenu key to access the 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.

Key Sequence: **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. If the span is changed using the arrow keys, the span changes in a 1-2-5 sequence for each key press.
Span 1.000 MHz	<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 Up 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.
Span Down 1-2-5	<b>Full Span:</b> Pressing this button sets the span to cover the entire tunable spectrum of the unit.
Full Span	<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 usable area while the instrument records the amplitude using slow sweep.
Zero Span	<b>Zero Span (Option 89):</b> Zero Span IF Output provides a 140 MHz IF signal out of a BNC female connector. The IF output signal is present only when the instrument span is set to zero. The user can select the one of four fixed IF bandwidths 7 MHz, 10 MHz, 16 MHz, or 32 MHz in addition to the bandwidths set by the instrument's RBW filters. When Normal is selected, the IF bandwidth is influenced by the RBW filters and can be any value from 1 MHz to 1 Hz. The exact bandwidth is wider than the selected RBW filter. This is not the suggested way to use IF output.
Last Span	<b>Last Span:</b> This submenu key returns the span to the most recent span value immediately before a change was made.
Last Span	<b>Back:</b> Returns to the previous menu
Back ←	

Figure 2-23. SPA Span Menu

## 2-26 BW (Bandwidth) Menu

Key Sequence: **BW**

BW	<b>RBW:</b> The current resolution bandwidth value is displayed in this submenu key. The RBW can be changed using the keypad, the arrow keys, or the rotary knob. The range is 10 Hz to 10 MHz in a 1-3 sequence, from 10 Hz to 30 Hz to 100 Hz, and so on.
RBW 3 MHz	<b>Auto RBW On/Off:</b> When Auto RBW is On, the instrument selects the resolution bandwidth based on the current span width. The ratio of span width to RBW can be specified using the Span/RBW submenu key.
Auto RBW <u>On</u> Off	<b>VBW:</b> The current video bandwidth value is displayed in this submenu key. The VBW can be changed using the keypad, the arrow keys, or the rotary knob. The range is 1 Hz to 10 MHz in a 1-3 sequence.
VBW 1 MHz	<b>Auto VBW On/Off:</b> When Auto VBW is On, the instrument selects the video bandwidth based on the resolution bandwidth. The ratio of video bandwidth to resolution bandwidth can be set using the RBW/VBW submenu key.
Auto VBW <u>On</u> Off	<b>VBW/Average Type:</b> Toggles between Linear averaging (arithmetic mean) and Logarithmic averaging (geometric mean).
VBW/Average Type <u>Linear</u> Log	<b>RBW/VBW:</b> This submenu key displays the ratio between resolution bandwidth and video bandwidth. To change the ratio, press this submenu key and use the keypad, the arrow keys, or the rotary knob to select a new ratio. The default ratio is 3. When the quasi-peak detector is selected the RBW/VBW ratio is changed to 1.
RBW/VBW 3	<b>Span/RBW:</b> This submenu key displays the ratio between the span width and the resolution bandwidth. The default value is 100, meaning that the span width is approximately 100 times the resolution bandwidth. The value is approximate because resolution bandwidth filters come in discrete steps while span width can be set to any value up to the maximum span of the instrument. To change the ratio, press this submenu key and use the keypad, the arrow keys, or the rotary knob to select a new ratio.
Span/RBW 100	

**Figure 2-24.** SPA Bandwidth Menu

## 2-27 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 (1/2)	<b>Marker:</b> Selects which marker (1, 2, 3, 4, 5, 6) is active. Increments from low to high with wrapping. The underlined marker number is the active marker. Press <b>Shift</b> then Marker to select markers in the opposite direction.
Marker <u>1</u> 2 3 4 5 6	<b>On/Off:</b> Turns the selected marker underlined in the Marker submenu key On or Off.
<u>On</u> Off	<b>Delta On/Off:</b> Turns on a delta marker and prompts for a delta offset frequency, either positive or negative from the frequency of the currently active marker.
Delta On <u>Off</u>	<b>Peak Search:</b> This key places the currently active marker on the highest signal amplitude currently displayed on screen.
Peak Search	<b>Marker Freq to Center:</b> Moves the frequency noted by the active marker to the center frequency position and center of the display.
Marker Freq to Center	<b>Marker to Ref Level:</b> Causes the amplitude of the currently active marker to become the reference level, which is the top horizontal line of the display.
Marker to Ref Lvl	<b>More Peak Options:</b> Brings up a secondary menu of submenu keys for more peak searching options. See the <a href="#">“More Peak Options Menu”</a> on page 2-37.
More Peak Options →	<b>More:</b> Opens a submenu of additional Marker options. See the <a href="#">“Marker 2/2 Menu”</a> on page 2-38.
More →	

Figure 2-25. SPA Marker (1/2) Menu



## More Peak Options 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	
Next Peak Left	<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 key allows the user to specify the performance of peak searching.
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.
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 zero span. If the delta marker value is set to less than 10 Hz, then the span will be set to 10 Hz. If no delta marker is turned on, no change is made.
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 2-36</a> .

**Figure 2-26.** SPA Marker & Peak Menu

## Marker 2/2 Menu

Key Sequence: **Marker** > More

<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Marker (2/2)</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     Marker Noise                      On      <u>Off</u> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     Market Table                      On    Large    <u>Off</u> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     All Markers                      Off                 </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     Counter Marker                      On      <u>Off</u> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     Set Marker                      to                      Channel                 </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     Marker Style                      Fixed      <u>Tracking</u> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     Marker 1 Reference                      On      <u>Off</u> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">                     Back                      ←                 </div>	<p><b>Marker Noise On/Off:</b> Turns the markers into noise markers with units of dBm/Hz. When this option is selected, the detection method is automatically changed to RMS and the displayed value is compensated for the noise bandwidth of resolution bandwidth filter.</p> <p><b>Marker Table On/Large/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. If Large is selected, a large screen display opens underneath the graph that displays both frequency and amplitude for the active marker in large type.</p> <p><b>All Markers Off:</b> Turns off all markers.</p> <p><b>Counter Marker On/Off:</b> Sets the frequency counter mode for the active marker. Marker frequency values are normally limited in resolution to individual display pixels. Each pixel may represent multiple frequencies. Using Counter Marker in association with Marker to Peak will result in the exact frequency of the peak to a resolution of 0.001 Hz.</p> <p><b>Set Marker To Channel:</b> If a signal standard has been selected, pressing this key brings up a dialog box to select a channel. Select a channel number for the current signal standard, and the active marker will be set to the center frequency of the channel.</p> <p>If no signal standard has been selected, a message “No standard selected. Press Enter or Escape to Continue.” is displayed. Press either button to leave the settings as they were before the key was pressed.</p> <p><b>Marker Style:</b> This key changes the behavior of the reference markers. If Fixed is selected, reference markers stay at the amplitude they were at when the associated delta marker was turned on. If Tracking is selected, the amplitude of the reference marker changes as the signal amplitude is changed. Note that the reference marker tracks the amplitude, not the frequency of a signal.</p> <p><b>Marker 1 Reference:</b> Selects whether Marker 1 is the reference for all six delta markers, or whether each of the six reference markers has an associated delta marker.</p> <p><b>Back:</b> Returns to the <a href="#">“Marker Menu” on page 2-36</a>.</p>
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Figure 2-27. SPA Marker (2/2) Menu

## 2-28 Sweep Menu

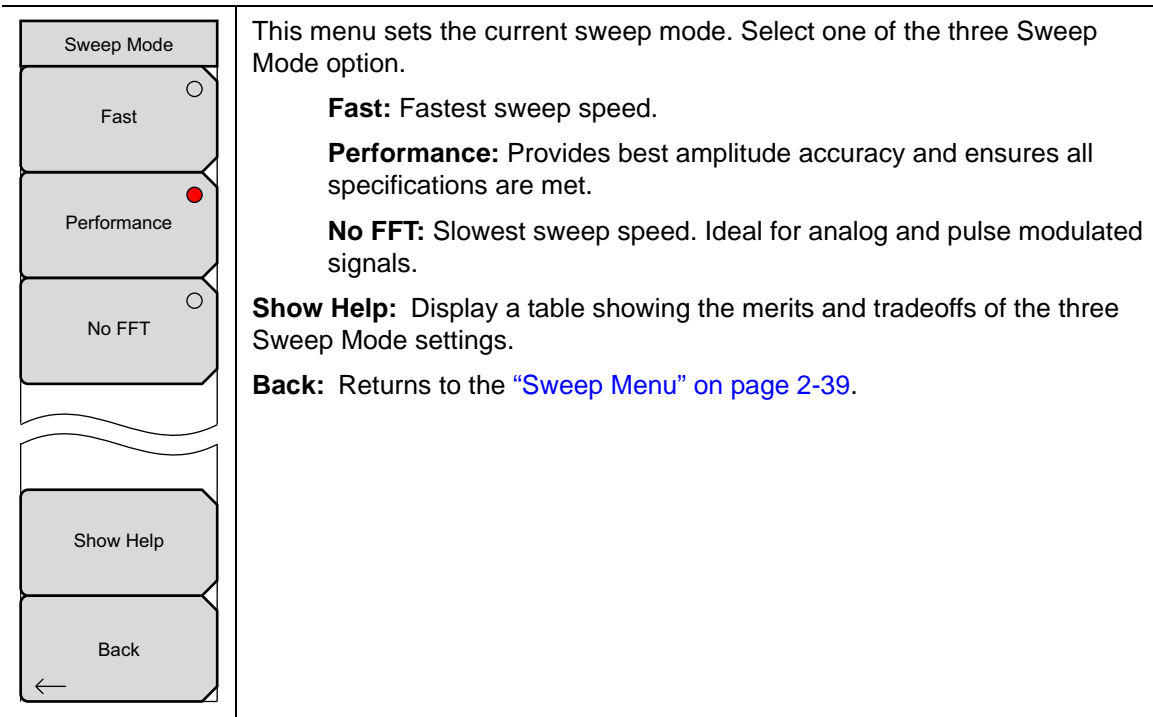
Key Sequence: **Shift** > **Sweep** (3) key

Sweep	<b>Sweep Single/Continuous:</b> 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 awaits a trigger event to start a new sweep.
Sweep Single Continuous	<b>Sweep Once:</b> When Sweep is set to Single, Sweep Once triggers a single measurement sweep. This key has no function when the instrument is in continuous sweep mode.
Sweep Once	<b>Sweep # Averages:</b> Sweeps the number of times set using the # of Averages button under the Trace A Ops menu. Trace A must be set to Averaging ( <b>Shift</b> > <b>Trace</b> (5) key > Trace A Operations > Average->Trace A) for this menu to function. Each trace is displayed using the exponential average of each sweep.
Sweep 10 Averages	<b>Sweep Mode</b> (Only available on some models): Pressing this submenu key opens the <a href="#">“Sweep Mode Menu (Only available on some models)”</a> on page 2-40.
Sweep Mode →	<b>Sweep Time:</b> Sets the sweep time for the measurement.
Sweep Time 100 ms	<b>Auto Sweep Time:</b> When Off, the measurement sweeps the time set in Sweep Time. When On, the instrument calculates a minimum sweep time and uses it for all subsequent sweeps.
Auto Sweep Time On Off	<b>Triggering:</b> Functional in Zero span only. Displays the <a href="#">“Triggering Menu”</a> on page 2-41.
Triggering →	<b>Gated Sweep Setup</b> (Option 90 Only): For configuring Gated Sweep. Opens the <a href="#">“Gate Setup Menu (Option 90)”</a> on page 2-42.
Gated Sweep Setup →	

**Figure 2-28.** SPA Sweep Menu

## Sweep Mode Menu (Only available on some models)

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



**Figure 2-29.** SPA Sweep Mode Menu

## Triggering Menu

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

Triggering	<b>Source:</b> Displays the Trigger Source Menu.
Source →	<b>Free Run:</b> In this mode, a new sweep is started immediately upon completion of an old sweep. No trigger event is required to initiate a sweep.
Delay	<b>External (TTL):</b> This mode is used in zero span. A TTL signal applied to the External Trigger BNC input connector causes a single sweep to occur. Triggering occurs on the rising edge of the signal. After the sweep is complete, the resultant trace is displayed until the next trigger signal arrives.
-1.0 %	<b>Video:</b> This mode is used in zero span to set the power level at which a sweep is initiated. The power level can be set from -130 dBm to +30 dBm, using the rotary knob, arrow keys, or keypad. The trigger is based on the measured signal level. If no signal reaches or exceeds the trigger level, there will be no trace on the screen.
Level	<b>Back:</b> Returns to the Triggering Menu.
N/A	<b>Delay XX %:</b> Used when External or Video buttons are activated. Measurement begins after set time delay once the trigger has occurred. The delay can be entered either as a percentage of the sweep time or as an absolute time delay with units of ns, μs or ms.
Slope	<b>Level:</b> Used when External or Video buttons are activated. Sets a level trigger to initiate a measurement.
Rising Falling	<b>Slope:</b> Sets the trigger slope to rising or falling.
Hysteresis	<b>Hysteresis:</b> When used, value unit is in dB. Hysteresis can be used with Level and Slope when setting a measurement trigger. Hysteresis is used to prevent undesired triggering when the signal is hovering near the trigger value. For example, the Level is set to 10 dBm, the Slope is set to Rising, and Hysteresis is 1 dB. The first trigger occurs when the signal at least reaches the 10 dBm level. To trigger again, the signal must drop below 9 dBm before returning to 10 dBm. For another example, with Level set to 10 dBm and slope set to Falling, and Hysteresis set to 1 dB, the opposite must occur to activate a trigger. The signal amplitude falls and a trigger occurs when the signal reaches the 10 dBm level. The signal must then reach at least 11 dBm before falling to 10 dBm and initiating a trigger.
N/A	<b>Holdoff:</b> Delays the next trigger to the time set regardless of triggers occurring within the set time.
Holdoff	<b>Force Trigger Once:</b> Forces a sweep regardless of meeting any trigger criteria.
N/A	<b>Back:</b> Returns to the "Sweep Menu" on page 2-39.
Force Trigger Once	
Back ←	
Trigger Source	
Free ●	
Run ○	
External ○	
Video ○	
Back ←	

Figure 2-30. SPA Triggering Menu

## Gate Setup Menu (Option 90)

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

Gate Setup	<b>Gated Sweep:</b> Turns the Gated Sweep function On and Off.
Gated Sweep On <u>Off</u>	<b>Gate Source:</b> Gate Source is currently only available using an External trigger signal that can be input using the instrument's Ext Trigger In connector.
Gate Source External	<b>Gate Polarity Rising/Falling:</b> Press to select the desired edge trigger to begin the gated sweep.
Gate Polarity <u>Rising</u> Falling	<b>Gate Delay:</b> Sets the start of the gated sweep indicated by the left border of the blue dashed rectangle shown in the bottom graph of <a href="#">Figure 2-1 on page 2-4</a> .
Gate Delay 60 $\mu$ s	<b>Gate Length:</b> Sets the length of the gate and is reflected on the zero span graph by the width of the blue rectangle as shown in <a href="#">Figure 2-1</a> .
Gate Length 25 $\mu$ s	<b>Gate View Settings:</b> Opens the Gate View Setting submenu. Allows a user to independently change the RBW, VBW and sweep time of the zero span or gate view (bottom graph).
Gate View Settings →	<p><b>Zero Span RBW:</b> Sets the resolution bandwidth of the zero span graph.</p> <p><b>Zero Span VBW:</b> Sets the video bandwidth of the zero span graph.</p> <p><b>Zero Span Time:</b> Sets the sweep time of the zero span graph.</p> <p><b>Back:</b> Returns to the Gate Setup menu.</p>
Back ←	<b>Back:</b> Returns to the <a href="#">"Sweep Menu" on page 2-39</a> and also changes the Gated Sweep Setup view back to the full screen Spectrum view. The Gated Sweep settings are retained and applied to the spectrum.
Gate View Settings	
Zero Span RBW 100 kHz	
Zero Span VBW 30 kHz	
Zero Span Time 500 $\mu$ s	
Back ←	

**Figure 2-31.** SPA Gated Sweep Menu

## 2-29 Measure Menu

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

Measure	<b>Field Strength:</b> This measurement allows the use of an antenna with known gain characteristics and measures the field strength over the frequency range of the antenna in units of dBm/m <sup>2</sup> , dBV/m, dBmV/m, dBμV/m, Volt/m or watts/m <sup>2</sup> . Opens the <a href="#">"Field Strength Menu"</a> on page 2-44.
Field Strength →	<b>OCC BW:</b> Opens the <a href="#">"OCC BW Menu"</a> on page 2-44. Select either% or dBc method of occupied bandwidth measurement.
OCC BW →	<b>Channel Power:</b> Activates the Channel Power measurement function. Opens the <a href="#">"Channel Power Menu"</a> on page 2-45.
Channel Power →	<b>ACPR:</b> Accesses a menu of Adjacent Channel Power Ratio measurement options. See the <a href="#">"ACPR Menu"</a> on page 2-46.
ACPR →	<b>AM/FM Demod:</b> The user can select AM, Narrow Band FM (300 μs de-emphasis), Wide Band FM (50 μs de-emphasis), Upper Sideband or Lower Sideband. See the <a href="#">"AM/FM Demod Menu"</a> on page 2-47.
AM/FM Demod →	<b>C/I:</b> The Carrier to Interference ratio is a two-step measurement sequence that first measures the amplitude of a carrier, then, with the carrier turned off, measures the amplitude of all other interfering signals within the channel bandwidth. See the <a href="#">"C/I Menu"</a> on page 2-48.
C/I →	<b>Measurement Off:</b> Turns any active measurement off.
Measurement Off →	<b>More:</b> Opens the <a href="#">"Measure 2/2 Menu"</a> on page 2-49.
More →	

**Figure 2-32.** SPA Measure Menu

## Field Strength Menu

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

	<p><b>On/Off:</b> Turns field strength measurements on or off.</p> <p><b>Antenna:</b> This submenu key brings up a dialog box that lists all the antennas for which the instrument has data, including both standard antennas and custom antennas that have been added using Master Software Tools. Use the <b>Up/Down</b> arrow keys or the rotary knob to select the desired antenna and press <b>Enter</b>.</p> <p><b>Back:</b> Returns to the <a href="#">“Measure Menu” on page 2-43</a>.</p>
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Figure 2-33. SPA Field Strength Menu

## OCC BW Menu

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

	<p><b>On/Off:</b> This submenu key turns the Occupied Bandwidth on or off.</p> <p><b>Method:</b> Select either the % of Power (default) or dB Down measurement method as displayed in the message area.</p> <p><b>%:</b> Use the keypad, the directional arrow keys, or the rotary knob to enter the percent of power, from 0% to 99%.</p> <p><b>dBc:</b> Use the keypad, the directional arrow keys, or the rotary knob to enter the dBc value (0 dBc to 100 dBc).</p> <p><b>Back:</b> Returns to the <a href="#">“Measure Menu” on page 2-43</a>.</p>
--	---

Figure 2-34. SPA OCC BW Menu



## Channel Power Menu

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

Channel Pwr	<b>On/Off:</b> Begins or ends the channel power measurement. When the measurement is on, Ch Pwr will appear below the display. The detection method will automatically be changed to RMS Average when the measurement is started. The detection method can be modified by pressing the <b>Shift</b> and the <b>Sweep</b> keys and pressing the Detection submenu key.
On Off	
Center Freq 1.939 900 GHz	<b>Center Freq:</b> Activates the center frequency function, and sets the center frequency of the instrument for the channel power measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the center frequency. The <b>Up/Down</b> arrows change the frequency by the frequency step size entered in the " <a href="#">Freq (Frequency) Menu</a> ". The <b>Left/Right</b> arrows change the frequency by 10% of the span.
Ch Pwr Width 24.960 MHz	
Span 24.960 MHz	<b>Ch Pwr Width:</b> Sets the width for the channel power. Use the keypad, the directional arrow keys, or the rotary knob to enter the channel power width. The <b>Up/Down</b> arrow keys change the Channel Power Width by the frequency step value. The <b>Left/Right</b> arrow keys change the value by 10% of the span.
Back	<b>Span:</b> Sets the span for channel power measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.
Back ←	<b>Back:</b> Returns to the " <a href="#">Measure Menu</a> " on page 2-43.

**Figure 2-35.** SPA Channel Power Menu

## ACPR Menu

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

ACPR	<b>On/Off:</b> Begins or ends the ACPR measurement.
On Off	<b>Main Ch BW:</b> Sets the bandwidth of the main channel for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input. Changing this value automatically changes the adjacent channel bandwidth and channel spacing.
Main Ch BW 8.320 MHz	<b>Adj Ch BW:</b> Sets the bandwidth of the adjacent channels for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input.
Adj Ch BW 8.320 MHz	<b>Ch Spacing:</b> Sets the channel spacing between the main and adjacent channels. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input. This value must be greater than or equal to half of the main channel bandwidth, plus half of the adjacent channel bandwidth. The <b>Up/Down</b> arrows change the frequency by the frequency step size entered in the <a href="#">“Freq (Frequency) Menu”</a> . The <b>Left/Right</b> arrow keys change the value by 10% of the span.
Ch Spacing 8.320 MHz	<b>Span:</b> Sets the span for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.
Span 24.960 MHz	<b>Back:</b> Returns to the <a href="#">“Measure Menu”</a> on page 2-43.
Back ←	

Figure 2-36. SPA ACPR Menu

## AM/FM Demod Menu

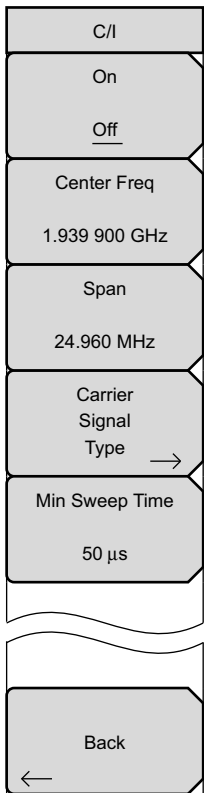
Key Sequence: **Shift** > **Measure** (4) key > AM/FM Demod

AM/FM Demod	<b>On/Off:</b> Turns AM/FM Demodulation on or off.
On	<b>Demod Type:</b> Provides submenu keys to select the type of signal to be demodulated:
Off	
Demod Type	<ul style="list-style-type: none"> <li>FM Wide Band</li> <li>FM Narrow Band</li> <li>AM</li> <li>USB</li> <li>LSB</li> </ul>
Demod Freq	<b>Demod Freq:</b> Use the keypad, the directional arrow keys, or the rotary knob to enter the center frequency of the signal to be demodulated. This frequency does not have to be within the current frequency sweep range to which the instrument is set.
10.350 MHz	
Demod Time	<b>Demod Time:</b> Use the keypad, the directional arrow keys, or the rotary knob to increase or decrease the demodulation time, and press the <b>Enter</b> key to select. The demodulation time can be set from 100 milliseconds to 200 seconds. The instrument sweeps one time for every demodulation period. Sweeping pauses during the demodulation time.
3 s	
Set Demod Freq to Current Marker Freq	<b>Set Demod Freq to Current Marker Freq:</b> Sets the demodulation frequency to the frequency of the current marker.
Beat Freq Osc	<b>Beat Freq Osc:</b> Sets the beat frequency of the oscillator to exactly set the demodulation frequency of USB and LSB signals. Displayed when USB or LSB is selected as the Demod Type.
0 Hz	
Volume	<b>Volume:</b> The current volume setting is displayed on the screen. Use the <b>Up/Down</b> arrow keys or rotary knob to change the volume, and press the <b>Enter</b> key to select.
Back	
←	<b>Back:</b> Returns to the <a href="#">"Measure Menu" on page 2-43.</a>

**Figure 2-37.** SPA AM/FM Demod Menu

## C/I Menu

Key Sequence: **Shift** > **Measure** (4) key > C/I



**On/Off:** Starts and stops the carrier to interference measurement.

**Center Freq:** Use the keypad, the directional arrow keys, or the rotary knob to enter the center frequency.

**Span:** Use the keypad, the directional arrow keys, or the rotary knob to enter the frequency span.

**Carrier Signal Type:** Opens a menu to select the carrier signal type.

**NB FHSS:** Narrow Band Frequency Hopping Spread Spectrum. Use this setting when the signal being measured is 802.11b.

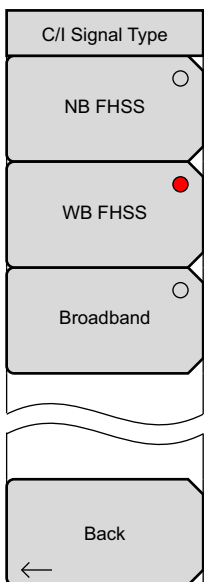
**WB FHSS:** Wide Band Frequency Hopping Spread Spectrum. Use this setting when the signal being measured is 802.11a or 802.11g.

**Broadband:** Use this setting when the signal being measured is a digital modulation format such as CDMA and GSM.

**Back:** Returns to C/I menu.

**Min Sweep Time:** Set the minimum sweep time for the measurement from 10 μs to 600 seconds.

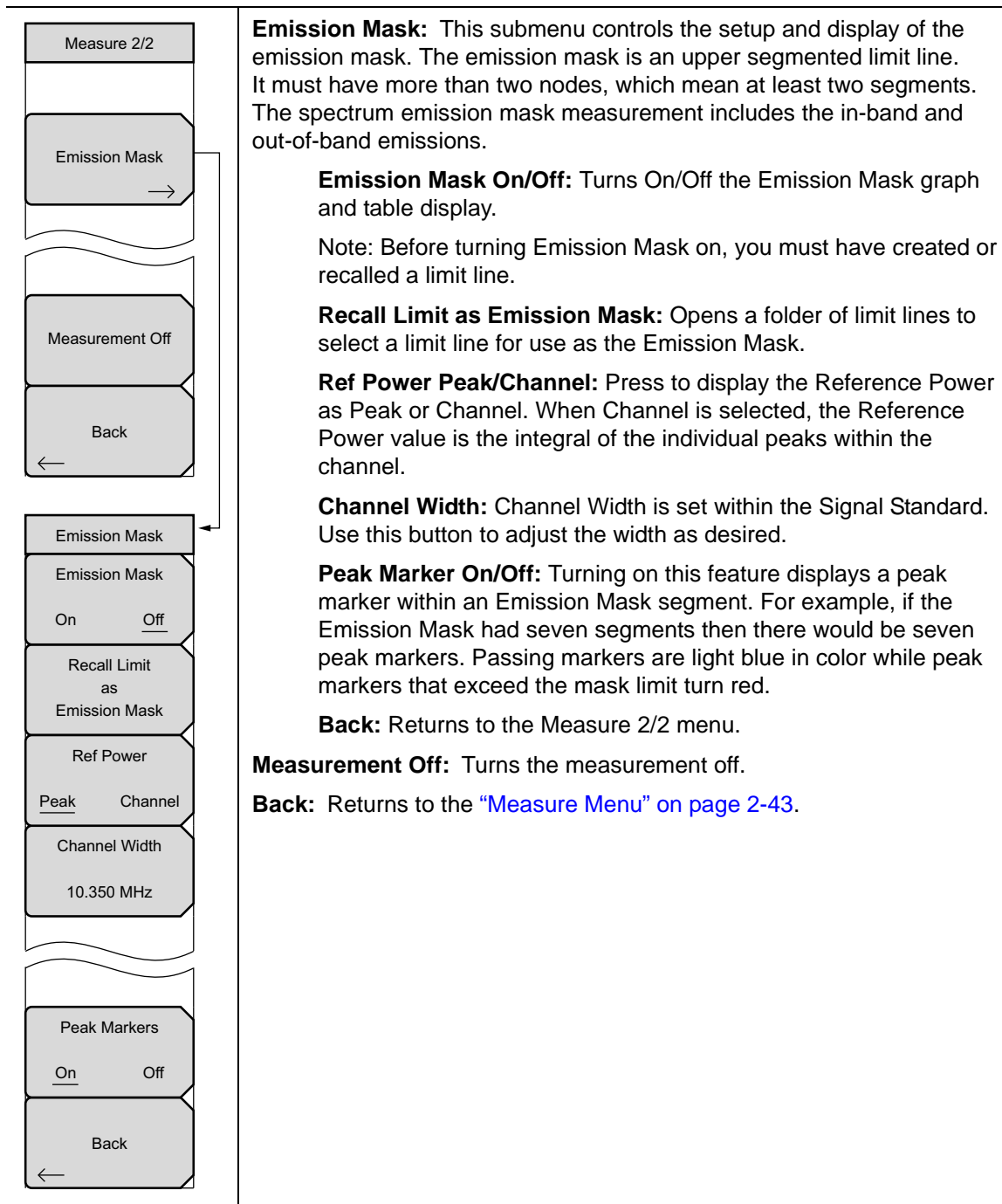
**Back:** Returns to the [“Measure Menu” on page 2-43](#).



**Figure 2-38.** SPA C/I Menu

## Measure 2/2 Menu

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



**Figure 2-39.** SPA Measure 2/2 Menu

## 2-30 Trace Menu

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

To access the functions under the Trace menu, press the **Shift** key, then the Trace (5) key. The instrument is capable of displaying up to three traces, one with live data, and the other two either with stored data or trace math data.

Trace	<b>Trace A, B, C:</b> Sets trace A, B, or C as the active trace. Each press of this key increments through trace A, B, and C. The active trace is underlined.
Trace	
<u>A</u> B C	<b>View/Blank:</b> Displays or hides the active trace.
<u>View</u>	<b>Write/Hold:</b> Selects between holding the current swept trace on the screen or continually sweeping and updating the displayed measurement. This is not applicable to Trace B or Trace C unless trace math involving Trace A is active.
Blank	
<u>Write</u>	<b>Trace A Operations:</b> Lists the Trace A Ops menu to select an operation that can be applied to Trace A. See <a href="#">“Trace A Ops Menu” on page 2-51</a> .
Hold	
Trace A	<b>Trace B Operations:</b> Lists the Trace B Ops menu to select an operation that can be applied to Trace B. See <a href="#">“Trace B Ops Menu” on page 2-52</a> .
Operations →	<b>Trace C Operations:</b> Lists the Trace C Ops menu to select an operation that can be applied to Trace C. See <a href="#">“Trace C Ops Menu” on page 2-53</a> .
Trace B	<b>Reset Trace:</b> Resets the trace averaging, Max Hold and Min Hold, and restarts the sweep.
Operations →	
Trace C	<b>Trace Info:</b> Stops the current trace and displays a summary table of trace parameters and current settings. Press <b>Enter</b> or <b>Escape</b> to clear the table from the display and restart the trace.
Operations →	
Reset	
Trace	
Trace Info	
→	

**Figure 2-40.** SPA Trace Menu

## Trace A Ops Menu

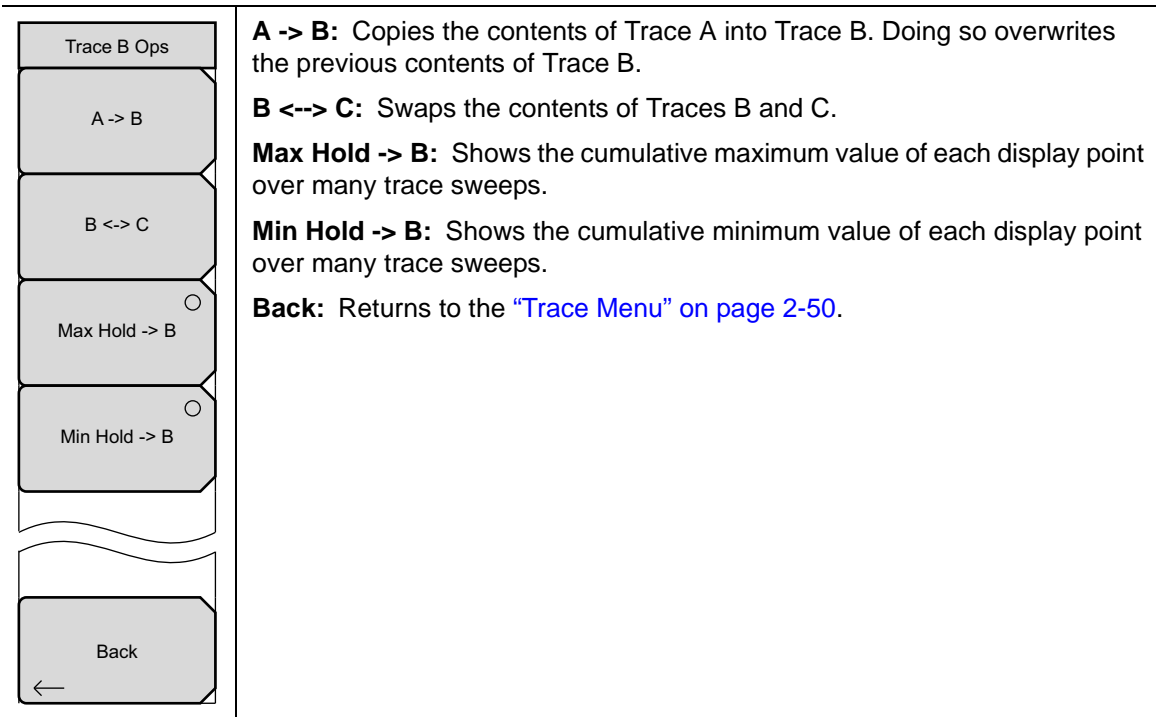
Key Sequence: **Shift** > **Trace** (5) key > Trace A Operations

Trace A Ops	<b>Normal -&gt; A:</b> Displays data for the current trace sweep.
Normal -> A <input checked="" type="radio"/>	<b>Max Hold -&gt; A:</b> Shows the cumulative maximum value of each display point over many trace sweeps.
Max Hold -> A <input type="radio"/>	<b>Min Hold -&gt; A:</b> Shows the cumulative minimum value of each display point over many trace sweeps.
Min Hold -> A <input type="radio"/>	<b>Average -&gt; A:</b> Shows an exponential average of a number of traces, determined by the # of Averages key.
Average -> A <input type="radio"/>	<b># of Averages:</b> Sets the number of traces for use in calculating the average display value. Then number used for averaging ranges from 1 to 65535.
# of Averages 10	<b>Back:</b> Returns to the <a href="#">"Trace Menu" on page 2-50</a> .
~ ~ ~	
Back ←	

**Figure 2-41.** SPA Trace A Ops Menu

## Trace B Ops Menu

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



**Figure 2-42.** SPA Trace B Ops Menu



## Trace C Ops Menu

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

Trace C Ops	<b>A -&gt; C:</b> Copies the contents of Trace A into Trace C. Doing so overwrites the previous contents of Trace C.
A -> C	<b>B &lt;-&gt; C:</b> Swaps the contents of Traces B and C.
B <-> C	<b>Max Hold -&gt; C:</b> Shows the cumulative maximum value of each display point over many trace sweeps.
Max Hold -> C	<b>Min Hold -&gt; C:</b> Shows the cumulative minimum value of each display point over many trace sweeps.
Min Hold -> C	<b>A - B -&gt; C:</b> Subtracts the value of trace B from trace A and places the results in Trace C. This function is very useful for observing the changes in values of live Trace A compared to a trace stored in Trace B.
A-B -> C	When trace math is active, a relative scale shows on the right side of the graph, and is associated to Trace C. This allows the user to optimize the display of Trace C without affecting the display of Traces A and B.
B-A -> C	<b>B - A -&gt; C:</b> Subtracts the value of Trace A from Trace B and places the results in Trace C. This function is very useful for observing the changes in values of live Trace A compared to a trace stored in Trace B. When trace math is active, a relative scale shows on the right side of the graph, and is associated to Trace C. This allows the user to optimize the display of Trace C without affecting the display of Traces A and B.
Relative Ref	<b>Relative Ref:</b> Sets the value applied to the top graticule for the relative scale that appears on the right side of the graph when trace math is active. Change this value by using the rotary knob, <b>Up/Down</b> arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the <b>Enter</b> key. This entry is valid only when trace math is active
10.0 dB	<b>Relative Scale:</b> Sets the value applied to the scaling of the relative scale that appears on the right side of the graph when trace math is active. Change this value by using the rotary knob, <b>Up/Down</b> arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the <b>Enter</b> key. This entry is valid only when trace math is active.
Relative Scale	<b>Back:</b> Returns to the <a href="#">"Trace Menu" on page 2-50.</a>
10 dB/div	

**Figure 2-43.** SPA Trace C Ops Menu

## 2-31 Limit Menu

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

The **Limit** menu keys are shown in the following figures.

Two types of limit lines can be specified, lower limit lines and upper limit lines. Limit lines can be used for visual reference only, or for pass/fail criteria using the limit alarm (Figure 2-44). Limit alarm failures are reported whenever a signal is above the upper limit line or below the lower limit line. By using save-on-event, a signal that exceeds the limit alarm can be automatically saved. See the User Guide for details.

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, which allows the configuring of specific limit envelopes at various frequencies of interest without having to re-configure them each time the frequency is changed.

Limit	<b>Limit:</b> This submenu key selects which limit line (Upper or Lower) will be active for editing. The limit line that is currently selected for editing is underlined.
Limit Upper    Lower	<b>On/Off:</b> This submenu key turns the active limit (upper or lower) on or off.
On Off	<b>Limit Edit:</b> This submenu key displays the “ <a href="#">Edit Menu</a> ” on page 2-55 that allows creating or editing of single or multi-segment limit lines. The currently active limit point is marked by a red circle on the display.
Limit Edit →	<b>Limit Move:</b> Press this submenu key to display the “ <a href="#">Limit Move Menu</a> ” on page 2-57.
Limit Move →	<b>Limit Envelope:</b> A limit envelope is very useful when you want to easily detect new signals in the presence of other preexisting signals. Use the limit envelope function to automatically create upper or lower limit lines that are based upon the on-screen measured spectrum analysis values. Refer to <a href="#">Figure 2-49</a> for an example limit envelope. Press this submenu key to open the “ <a href="#">Limit Envelope Menu</a> ” on page 2-58.
Limit Envelope →	<b>Limit Advanced:</b> Press this submenu key to open the Limit Advanced submenu key menu. The advanced limit line section offers several useful functions. In this section, you can create either an absolute limit line (which is one based upon the frequencies that are entered for each inflection point) or a relative limit line (which is based upon the delta frequencies between the center frequency and the inflection points). Both types of limit lines can be saved and recalled. Press this submenu key to open the “ <a href="#">Limit Advanced Menu</a> ” on page 2-60.
Limit Advanced →	<b>Limit Alarm On/Off:</b> Pressing this submenu key toggles the alarm function ON and OFF for the currently active limit line. When ON, an alarm beep will occur when a data point exceeds the limit.
Limit Alarm On    Off	<b>Set Default Limit:</b> Pressing this submenu key deletes all limit points for the currently active limit line and sets the default limit line value, which is a single limit whose position is 2.5 grid lines from the top of the screen (for the upper limit line) or 2.5 grid lines from the bottom of the screen (for the lower limit line), depending upon which limit is active. The inactive limit line is not altered.
Set Default Limit	

Figure 2-44. SPA Limit Menu

## Edit Menu

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

Edit	<p><b>Frequency:</b> Press this submenu key to set the frequency of a limit line inflection point. The frequency of each inflection 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 it takes on the stop frequency of the current sweep if no point is 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 an inflection point. The <b>Left/Right</b> arrows move the inflection point by 5% of the span.</p> <p><b>Amplitude:</b> Press this submenu key to set the amplitude of a limit line inflection point. The amplitude of each inflection 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 (using the <math>\pm</math> key to set a negative value), 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 details. The <b>Up/Down</b> arrows move the amplitude by 5% of the screen height.</p> <p><b>Add Point:</b> Press this submenu key to add a limit line inflection point. The precise behavior of this submenu key depends upon which inflection point is active at the time that the key is pressed. If the active limit point is somewhere in the middle of a multi-segment limit line, then a new limit point is added that is halfway between the currently active point and the point immediately to its right. The amplitude of the inflection point will be such that it falls on the limit line. For example, if a limit point exists at 2.0 GHz with an amplitude of <math>-30</math> dBm, and if the next point is 3.0 GHz with an amplitude of <math>-50</math> dBm, then 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.</p> <p>If the last limit point is active (assuming it is not at the right edge of the display), then 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>
Frequency 1.964 718 182 GHz	
Amplitude -75.0 dBm	
Add Point	
Add Vertical	
Delete Point	
Next Point Left	
Next Point Right	
Back ←	

**Figure 2-45.** SPA Limit Edit Menu (1 of 2)

## Edit Menu (Continued)

Edit	<b>Add Vertical:</b> In many measurement masks, step changes occur in the value of the limit line. Press this submenu key to add two inflection points. The two inflection points share the same frequency and are centered midpoint between adjacent measured points. The magnitudes of the points are set by using a visually intuitive algorithm that is based upon the adjacent inflection points.
Frequency 1.964 718 182 GHz	You can adjust the magnitudes independently, but the frequencies of the two points remain linked and are adjusted as a vertical pair. Setting a discrete frequency, a limit inflection point will keep that exact frequency and place the limit point appropriately regardless of the frequency span. This is especially useful for emission mask verification.
Amplitude -75.0 dBm	<b>Delete Point:</b> Press this submenu key to delete the currently active point. The active point becomes the point that is immediately to the left of the point that was deleted.
Add Point	<b>Next Point Left:</b> Press this submenu key to select the inflection point that is immediately to the left of the active point, making this newly selected point active for editing or deletion. With each key press, the active point becomes that point to the left of the previously active point, until the newly selected active point becomes the left-most point on the screen.
Add Vertical	<b>Next Point Right:</b> Press this submenu key to select the limit point immediately to the right of the active point, making this newly selected point active for editing or deletion. With each key press, the active point becomes that point to the right of the previously active point, until the newly selected active point becomes the right-most point on the screen.
Delete Point	<b>Back:</b> Press this submenu key to return to the <a href="#">“Limit Menu” on page 2-54</a> .
Next Point Left	
Next Point Right	
Back ←	

Figure 2-46. SPA Limit Edit Menu (2 of 2)

## Limit Move Menu

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

Limit Move	<b>Move Limit to Current Center Freq:</b> Pressing this submenu key moves the center of the existing limit line to the center frequency of the measurement. The span of the existing limit line is not changed by doing this. Use this submenu key as an easy way to get an existing limit line on screen. If no limit line is turned on, then a new, flat default limit line is turned on and is located 2.5 grid lines from the top of the screen for the upper limit line or 2.5 grid lines from the bottom of the screen for the lower limit line.
Move Limit to Current Center Freq	
Move Limit U/D 0.0 dB	<b>Move Limit U/D ## dB:</b> If the limit line is flat, then use this submenu key to move the limit line to an absolute power point in dBm. If the limit line is not flat, then use this submenu key to move the limit line up or down by the selected number of dB. Use the keyboard to enter the desired value. The entire line moves by the amount that is entered. The limit line can also be moved by using the rotary knob. Turn the rotary knob clockwise to move the line to higher power levels. The <b>Up/Down</b> arrows move the limit line by 5% of the screen height. The <b>Left/Right</b> arrows move the limit line by 0.2% of the screen height or 0.2 dB when the scale is set to 10 dB/division.
Move Limit L/R 0 Hz	
Move Limit to Marker 1	<b>Move Limit L/R ## Hz:</b> Pressing this submenu key allows you to adjust the frequencies of the limit line. All inflection points are moved by the value entered. The rotary knob can also be used to make this adjustment. Turn the rotary knob clockwise to move the limit line to higher frequencies. The <b>Left/Right</b> arrows move the limit line by 5% of the span while the <b>Up/Down</b> arrows move the line by one display pixel.
Offset from Marker 1 10.0 dB	
Back	<b>Move Limit to Marker 1:</b> Press this submenu key to move the frequency and amplitude of the center frequency of the limit line to the frequency and amplitude of Marker 1 (assuming that the Offset from Marker 1 submenu key is set to 0 dB).
Back	
Back	<b>Offset from Marker 1 ## dB:</b> Press this submenu key to set a limit line offset value from Marker 1 amplitude. This feature moves the limit line amplitude and frequency as needed to place the center of the limit line the user-specified number of dB from the position of Marker 1. Positive values place the limit line above Marker 1, and negative values place the limit line below Marker 1.
Back	<b>Back:</b> Press this submenu key to return to the <a href="#">“Limit Menu” on page 2-54</a> .

**Figure 2-47.** SPA Limit Move Menu

## Limit Envelope Menu

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

Limit Envelope	<p><b>Create Envelope:</b> Press this submenu key to generate the envelope using the Limit Envelope characteristics. If the default results are not satisfactory, then you can make adjustments to the amplitude and frequency of each inflection point, and you can add or delete inflection points.</p> <p><b>Update Envelope Amplitude:</b> While working on your envelope (or if your signal amplitude changes), you may want to adjust the amplitude of the current limit without changing the frequencies of the inflection points. Pressing this submenu key makes those amplitude adjustments without frequency adjustments.</p> <p><b>Upper Points</b> (if Upper Limit is selected)  <b>Lower Points</b> (if Lower Limit is selected): Use this submenu key to define how many inflection points you want for the selected upper or lower limit envelopes. The value can be between 2 and 41. Note that the upper and lower limit lines do not need to have the same number of points.</p> <p><b>Upper Offset</b> (if Limit is toggled to Upper)  <b>Lower Offset</b> (if Limit is toggled to Lower): This submenu key is used to define how far away from the measured signal the upper or lower envelope will be placed. The limits are <math>\pm 100</math> dB. For an upper envelope, usually the value will be positive in order to place the envelope above the signal. For a lower envelope, the value will usually be negative in order to place the envelope below the signal.</p> <p><b>Upper Shape</b> (if Limit is toggled to Upper)  <b>Lower Shape</b> (if Limit is toggled to Lower): Press this submenu key to choose whether the default for the upper or lower envelope will be with flat tops (Square setting) and reasonably vertical lines to change level or whether the envelope will have sloped lines (Slope setting) between adjacent inflection points. When the square envelope type is selected, two inflection points are used for each horizontal segment. You can toggle between a square envelope and a sloped envelope by pressing this submenu key. <a href="#">Figure 2-49</a> is an example of a Square Limit Envelope.</p> <p><b>Back:</b> Press this submenu key to return to the "Limit Menu" on <a href="#">page 2-54</a>.</p>
Create Envelope	
Update Envelope Amplitude	
Upper Points 21	
Upper Offset 3.0 dB	
Upper Shape Square    Slope	
Back ←	

**Figure 2-48.** SPA Limit Envelope Menu

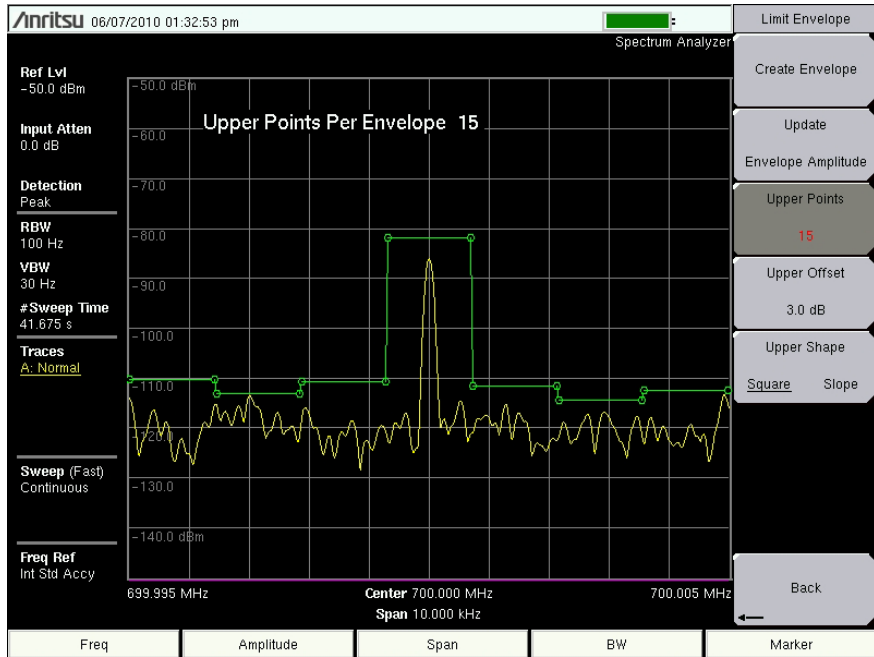


Figure 2-49. Square Limit Envelope

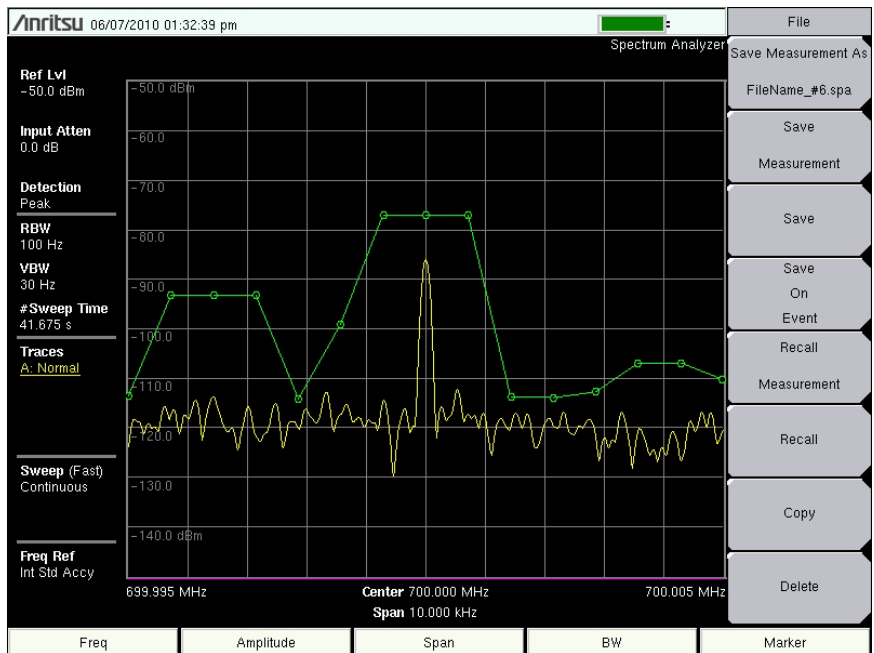
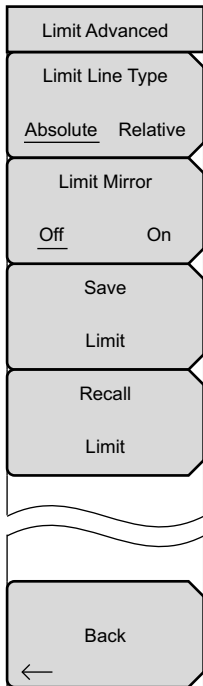


Figure 2-50. Sloped Limit Envelope

## Limit Advanced Menu

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



**Limit Line Type:** Press this submenu key to choose to have either limit line be absolute or be relative. This submenu key may be used at any time while working with limit lines. Absolute limit lines set the limit inflection points based upon the entered frequencies for each point. Relative limit lines set the limit inflection points relative to the current center frequency. Regardless of how a limit line is set up, saved, or recalled, it can be changed between absolute and relative by toggling with this submenu key.

**Limit Mirror Of/On:** Press this submenu key to turn the Limit Mirror feature On and Off.

Many emission masks are symmetrical. The low frequency side is identical to the upper side. The Limit Mirror feature allows you to create half of the limit line and get the other half built automatically. This feature can work in either of two ways:

Turn Limit Mirror on before beginning to build a limit line. As you add a point on either side of the center frequency, another point is automatically added on the opposite side of the center frequency.

Leave Limit Mirror off until half of the limit line is built, then turn On Limit Mirror. the other half of the limit line is built automatically.

**Save Limit:** Pressing this submenu key opens a dialog to save the current upper and lower limit lines. You can name the saved limit line yourself or accept the name that is suggested by the instrument (which is based upon a previously saved name). If you did not intend to save the limit line, then press Esc to stop the dialog and avoid saving the limit line.

**Recall Limit:** Pressing this submenu key opens a dialog box to recall a saved limit line. The dialog box presents a list of saved limit lines. Highlight the desired limit line and press **Enter**. If you decide not to recall a limit line, then press Esc to stop the dialog.

If the saved limit is a relative limit, then it is recalled centered about the current center frequency. If the saved limit is an absolute limit, then it is recalled to the frequency at which it was created.

If you recall an absolute limit, and if it is off screen, then you will see the left or right limit off-screen indicator on the edge of the screen.

**Back:** Press this submenu key to return to the [“Limit Menu” on page 2-54](#).

**Figure 2-51.** SPA Limit Advanced Menu



## 2-32 Application Options

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

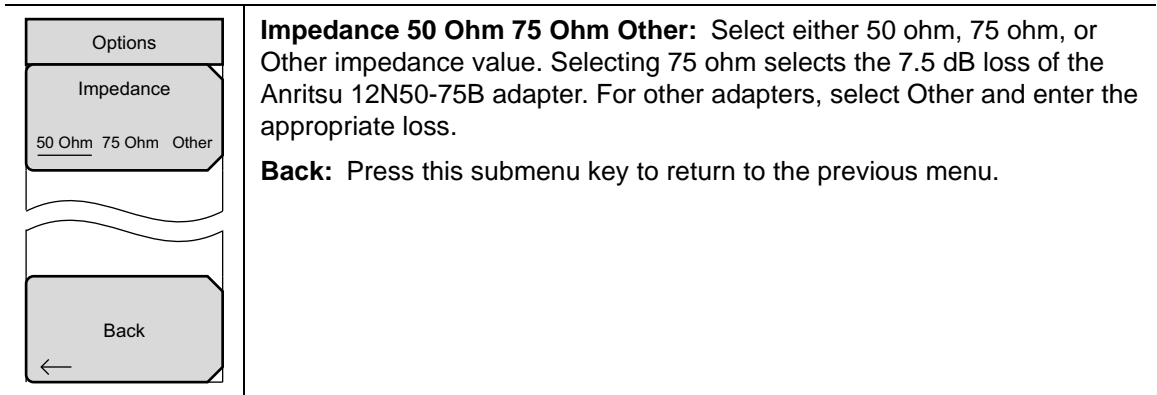


Figure 2-52. SPA Application Options

## 2-33 Other Menus

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



# Chapter 3 — Interference Analyzer (Option 25)

## 3-1 Introduction

Many wireless networks operate in complicated signal environments. Three or four base station antennas may be located on the same tower, and can create interference problems, which can affect system capacity and coverage.

The Interference Analyzer (option 25) adds five measurement capabilities to the spectrum analyzer:

- [Section 3-4 “Spectrogram” on page 3-2](#)
- [Section 3-5 “Signal Strength” on page 3-4](#)
- [Section 3-6 “Received Signal Strength Indicator \(RSSI\)” on page 3-5](#)
- [Section 3-7 “Signal ID” on page 3-6](#)
- [Section 3-8 “Interference Mapping” on page 3-8](#)

The instrument also has a spectrum mode which displays signals in a traditional spectrum analyzer view.

<b>Note</b>	Set the instrument to Interference Analyzer mode for all the measurements in this chapter.
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## 3-2 General Measurement Setups

Please refer to your User Guide for selecting the Interference Analysis mode, setting up frequency, span, amplitude, GPS, limit lines, markers, and file management.

## 3-3 Spectrum

In Spectrum Analyzer mode, smart one-button measurements are built-in for field strength, occupied bandwidth, channel power, adjacent channel power ratio, and carrier to interference ratio (C/I) tests. In addition, AM/FM/SSB demodulation is available to aid in the identification of interfering signals. This section presents brief examples demonstrating the use of these measurements.

Press the **Measurements** main menu key followed by the **Spectrum** submenu key. Refer to [“Field Measurements” on page 2-8](#) for further spectrum measurement procedures.

## 3-4 Spectrogram

A Spectrogram is a three dimensional representation of frequency, time and power useful for identifying intermittent interference. Color is used to represent power levels.

### Required Equipment

- An antenna that is appropriate for the frequency range to be measured

### Required Setup

- Place the instrument in Interference Analyzer mode.
- Connect the antenna to the RF In test port.

### Procedure

The following procedure demonstrates one example of an Interference Analyzer Spectrogram setup.

1. For the most effective spectrogram display, press the **Amplitude** main menu key, press the **Reference Level** submenu key and set the reference level such that the largest signal to be displayed will be near the top of the spectrum analyzer area of the screen. The reference value required can be determined by observing the color of the highest signal and changing the reference level to place that value near the top of the spectrum analyzer area.
2. Press the **Scale** submenu key and set the scale value to place the lowest signal near the bottom of the screen. In general, 4 dB/division or 5 dB/division will be good starting values.
3. Press the **BW** main menu key and set Auto RBW and Auto VBW On, or set the applicable RBW and VBW values by pressing the RBW and VBW submenu keys.
4. Press the **Measurements** main menu key, then the **Spectrogram** submenu key to display the spectrogram. Press the **Spectrogram** key again to open the Spectrogram Menu.
5. Set the time between sweeps by pressing the **Sweep Interval** submenu key, or set the total time for a full spectrogram by pressing the **Time Span** submenu key.
6. To change the time between sweeps, press the **Sweep Interval** submenu key and use the rotary knob or keypad to set the time from 0 seconds to 660 seconds. Entering the time interval value causes the corresponding time span value to be automatically computed. The time span can be viewed or changed by pressing the **Time Span** submenu key and using the rotary knob or keypad to set the span. Changing the time span will automatically change the sweep interval.

<b>Note</b>	Setting a Sweep Interval value > 0 will change the detection method to Max Hold, so that any event within the time interval will be captured to the screen. This allows extended measurement times to be set.
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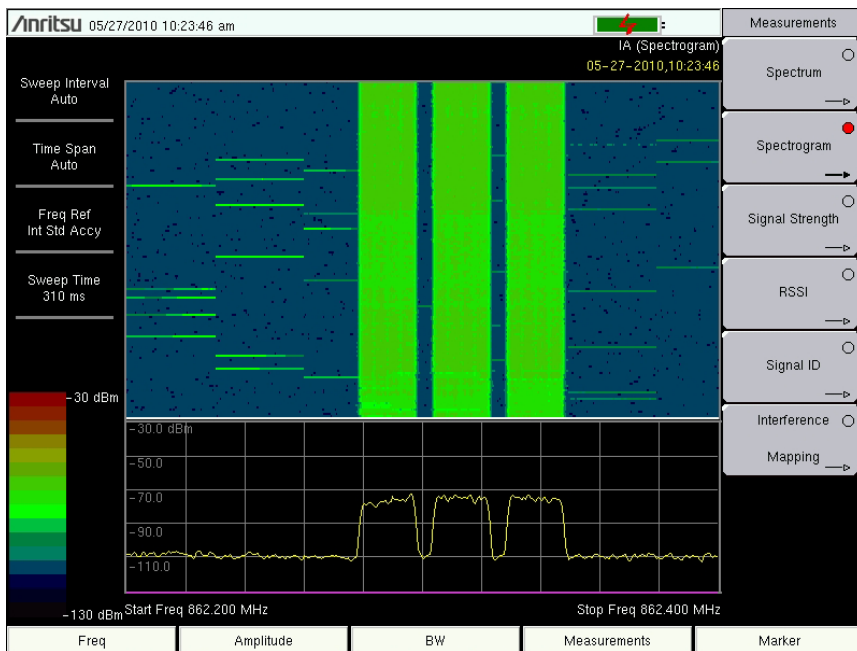
7. To set the total time span for a complete display, press the **Time Span** submenu key and use the rotary knob or keypad to enter a time between 1 minute and 4,320 minutes (72 hours). Entering a time span value causes the corresponding sweep interval value to be automatically computed and shown when the **Sweep Interval** submenu key is pressed.
8. The instrument can be set so that spectrogram plots are automatically saved when the display is full. Press the **Record** submenu key to toggle saving On or Off.

9. The Time Cursor submenu key is used to turn on the horizontal time cursor. Use the **Up/Down** arrow key to move the cursor vertically through the spectrogram. The date and time that the measurement at the cursor position was taken is displayed at the top of the screen.

**Note** When the Time Cursor is activated and is not on the zero trace position, the unit will automatically stop making measurements.

10. Press the **Marker** main menu key to place up to six markers on the signal and display the power and frequency at each marker position.

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



**Figure 3-1.** Interference Analyzer Spectrogram

## 3-5 Signal Strength

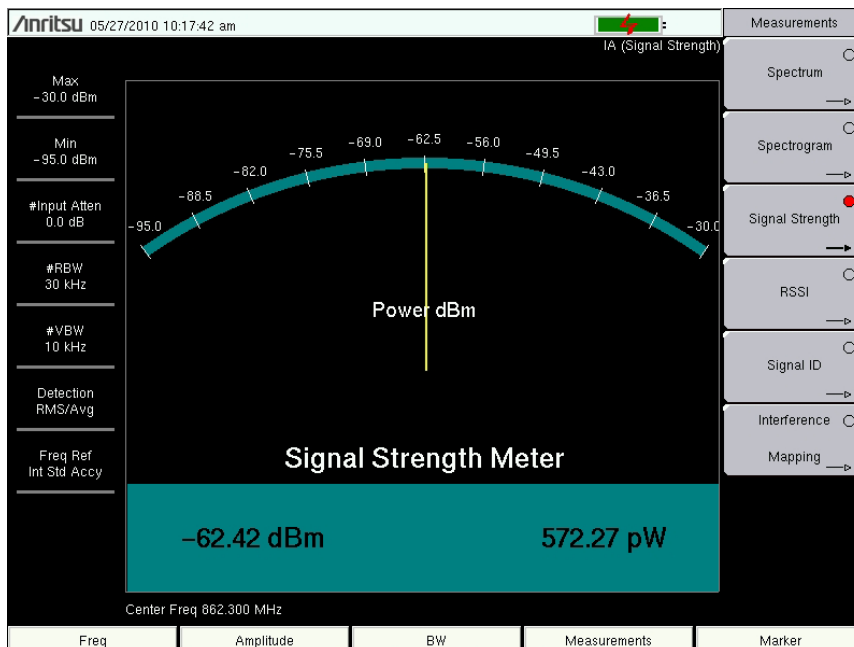
The Signal Strength meter is useful for tracking down the source of an interfering signal. This measurement is done at a single frequency in zero span. The power at a frequency (in dBm and watts) is displayed along with an optional audible indicator. Connect a directional antenna and the frequency of the audible indicator increases as the measured signal strength increases. This mode is especially useful when attempting to locate an emitter using a directional antenna.

For field strength measurements, antenna factors are included. Antenna factors for all antennas offered by Anritsu are stored in the unit. Custom antenna factors can be created and uploaded into the instrument using Anritsu Master Software Tools software.

### Procedure

The following procedure demonstrates a common Interference Analyzer Signal Strength setup.

1. Connect the appropriate directional antenna to the RF In port and press the **Measurements** main menu key.
2. Press the **Signal Strength** submenu key to display the Signal Strength Meter. Press the **Signal Strength** submenu key again to open the Signal Strength menu.
3. Press the **Auto Scale** submenu key to automatically scale the display range, or set the desired maximum and minimum values by pressing the **Max Level** and **Min Level** submenu keys.
4. Press the **Speaker On/Off** submenu key to turn on the audio output.
5. If necessary, press the **Volume** submenu key to set the speaker or headphone volume to a comfortable level. Use the **Up/Down** arrow keys to adjust the volume.



**Figure 3-2.** Interference Analyzer Signal Strength

## 3-6 Received Signal Strength Indicator (RSSI)

RSSI is useful for observing signal strength at a single frequency over time.

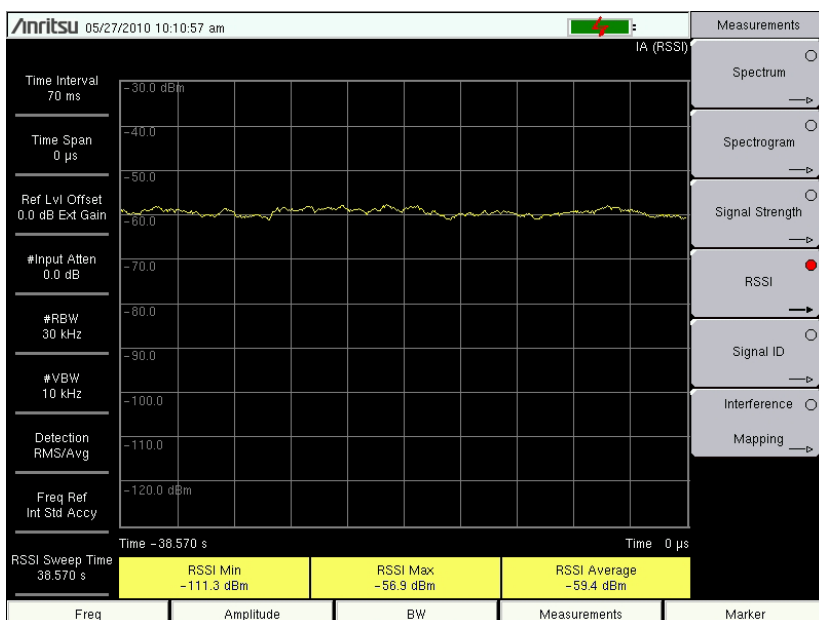
### Procedure

The following procedure demonstrates a common Interference Analyzer RSSI setup. To select Interference Analyzer mode:

1. Press the **Measurements** main menu key, then press the RSSI submenu key to bring up the RSSI display. Press the RSSI key again to open the RSSI menu.
2. Press the Time Interval submenu key to set the time between adjacent measurement points. This time may be set from 70 ms to 1 minute.
3. Press the Time Span submenu key to set the overall time span for the RSSI measurement. This time can be set from zero, to give manual control of the time span, to a maximum of seven days. After the specified time span, the measurement is halted. Depending upon the time interval selected, the data will scroll to the left once the trace fills the screen.
4. Press the Auto Scale key to automatically set the reference level and scale factor to place the trace on the screen.

**Note** The Time Span only captures the last display, not the entire time of the Time Span. Use a longer time interval to extend the effective trace capture time.

5. To store the RSSI data, press the Record On/Off submenu key to turn on data logging. The data is named Log – followed by the time at which the data was stored. Each screen full of 551 data points will be stored as a separate display, and up to seven days of data can be saved. The unit saves the data in the saved trace directory and it can be recalled by selecting recall trace measurement.



**Figure 3-3.** Interference Analyzer RSSI

## 3-7 Signal ID

The Signal ID feature in the Interference Analyzer helps to quickly identify the different types of interfering signals with a signal to noise ratio of 10 dB or greater. You can configure the Signal ID measurement parameters to identify all signals within the selected band or monitor one single interfering frequency. The results displayed include the Center Frequency, Bandwidth of the signal, the type of the signal (FM, CDMA, GSM, WCDMA, and WLAN), its closest channel number, the number of carriers, its signal to noise ratio, and the channel power of the signal. The spectrum of the signal is colored blue to easily review the scanned signals.

### Procedure

The following procedure demonstrates one example of an Interference Analyzer Signal ID setup.

1. For the most effective signal ID display, press the **Amplitude** main menu key followed by pressing the **Reference Level** submenu key. Set the reference level such that the largest signal to be displayed will be near the top of the graph area of the screen. The reference value required can be determined by observing the peak of the highest signal and changing the reference level to place that value near the top of the graph display.
2. Press the **Scale** submenu key and set the scale value to place the lowest signal near the bottom of the screen. In general, 4 dB/division or 5 dB/division will be good starting values.
3. Press the **BW** main menu key and set Auto RBW and Auto VBW On, or set the applicable RBW and VBW values by selecting the RBW and VBW submenu keys.
4. Press the **Measurements** main menu key
5. Press the **Signal ID** submenu key to activate the measurement. Press **Signal ID** again to list the Signal ID menu and to set up the Signal ID test parameters. Set up these parameters as desired – Scan Type, Scan Freq, Continuous Monitoring, Single Sweep and Review.

To view the Signal ID data of a single frequency.

1. In the Signal ID menu, press the **Scan Type** submenu key so that **All** is selected (underlined).
2. Press the **Single Sweep and Review** submenu key. A center frequency and its accompanying data are highlighted in the table below the graph. In the graph, a dotted red line marks the center frequency and the band of blue is the associated bandwidth. Scroll to the desired center frequency in the table and the red dotted line and band of blue will track accordingly.
3. Press the **Scan Type** submenu key so that **Freq** is selected. The center frequency that was in the table selected is entered as the Scan Freq submenu key frequency automatically. Now, instead of sweeping across the whole span, the measurement will only identify the selected frequency and will display its Channel Power as well.



4. Press the desired sweep mode submenu key, Continuous Monitoring or Single Sweep and Review.

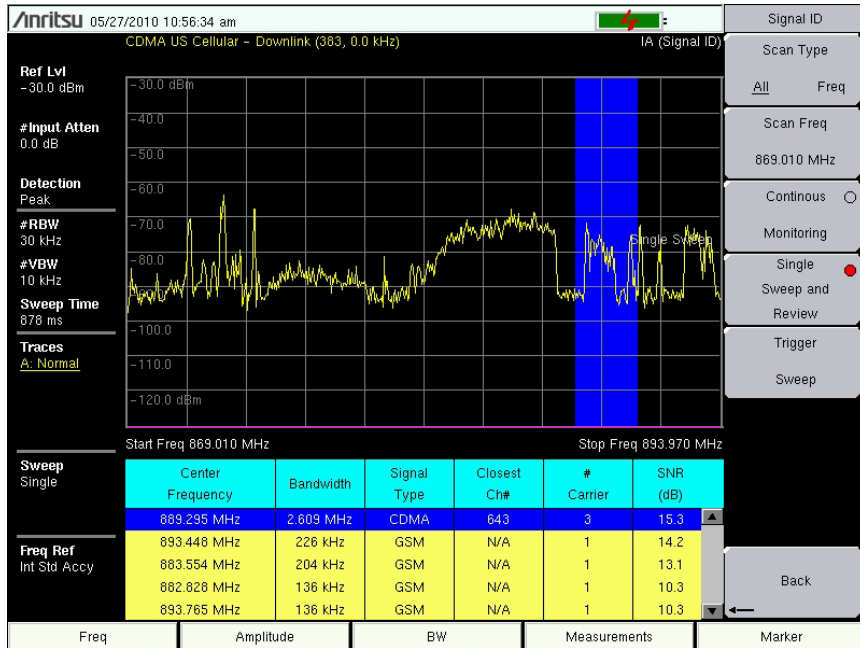


Figure 3-4. Interference Analyzer Signal ID, All Scan Type

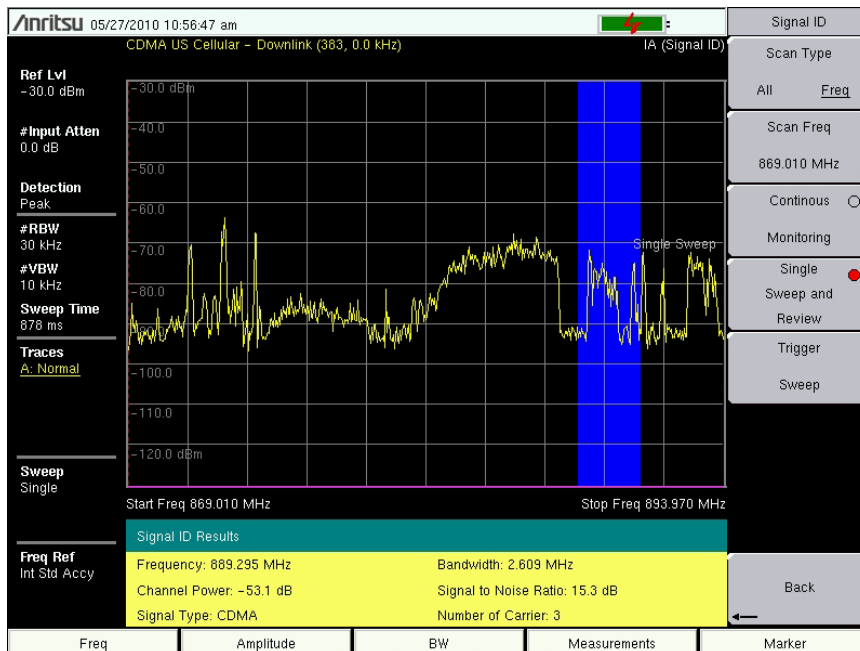


Figure 3-5. Interference Analyzer Signal ID, Freq Scan Type

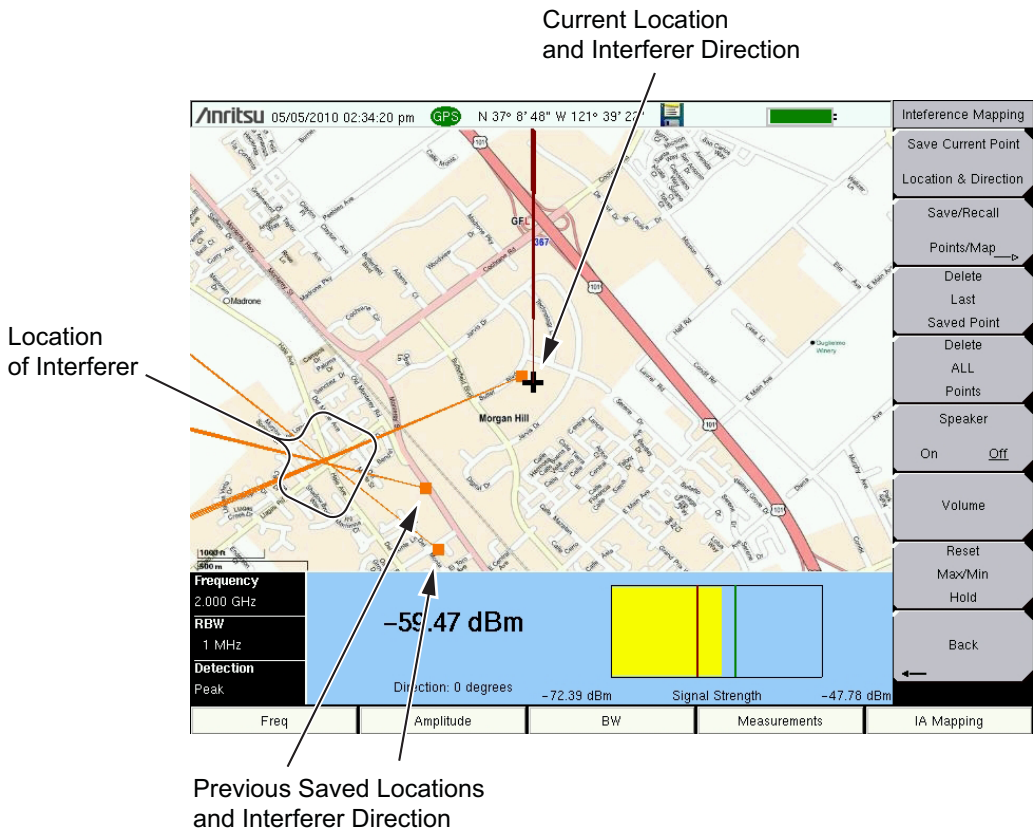
### 3-8 Interference Mapping

**Note** Interference Mapping requires Option 31, GPS.

Interference Mapping assists in quickly identifying the location of an interfering signal using a directional antenna and a GeoEmbedded map created using Anritsu Map Master software.

The Map Master program creates special maps compatible with the Anritsu Site Masters/Spectrum Masters/Cell Masters. The software imports maps from any map provider and creates files with or without GPS information. The files will have a .map extension. Anritsu Map Master is shipped with the instrument on a CD and is also available from the Anritsu web site ([www.anritsu.com](http://www.anritsu.com)).

With a valid GPS signal, the instrument will identify the current location on the displayed map with a cross. Saved locations are displayed with an orange square. Using a directional antenna, the direction of the interfering signal can be determined and recorded. With two or more lines, you can see where the lines intersect and estimate the location of interferer.



**Figure 3-6.** Interference Mapping

Mapping Interference is a four step process:

- Create a map using “Anritsu Map Master”.
- Load the map and configure the “Instrument Settings” on page 3-13.
- Install a directional antenna on the instrument and track the interfering direction to “Locate the Interfering Signal” on page 3-15.
- “Save the Interference Information” on page 3-16.

## Anritsu Map Master

Anritsu Map Master allows you to capture maps of any location and create Anritsu Map Files. These Anritsu Map Files are used for Interference Mapping (Option 25) and Coverage Mapping (Option 431).

Install the software from the CD that came with the instrument or download and install Anritsu Map Master from the Anritsu web site ([www.anritsu.com](http://www.anritsu.com)).

### Create a Map File with Map Master

Map Master is a program that allows you to create a map from any map provider such as Google Earth, Map Point, Yahoo Maps, openstreetmap, and others. There are two options for creating maps using Map Master. *Method 1*, using a bitmapped image, is describe below.

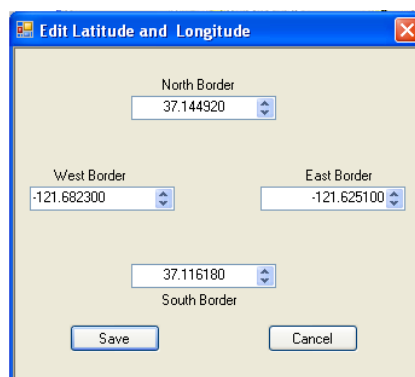
*Method 2*, entering an address in Map Master, is described on page 3-11.

**Method 1:** Open a JPEG, GIF, TIFF, or PNG file and adding GPS data.

1. Capture a bitmapped image of a map from a map provider and save in one of the file formats mentioned above.

The image size should be close to 666 pixels x 420 pixels (~1.6:1 ratio).

2. Launch the Anritsu Map Master application.
3. In the File pull-down menu, select Open and choose the image file to convert to a map.
4. A dialog box will confirm that the file has been converted to a Anritsu Map Master (.map) file with the same file name.
5. Answer Yes at the Geo Map? dialog box.
6. From the Edit GPS Info pull-down menu select Set Latitude and Longitude (Figure 3-7).
7. Enter the longitude information in decimal degrees for the West and East Border
8. Enter the latitude information in decimal degrees for the North and South Border.



**Figure 3-7.** Adding GPS data to the Map.

9. If you only have GPS information in the Degree-Minute-Second (DMS) format, use the following relationship to convert to Decimal Degrees (DD):

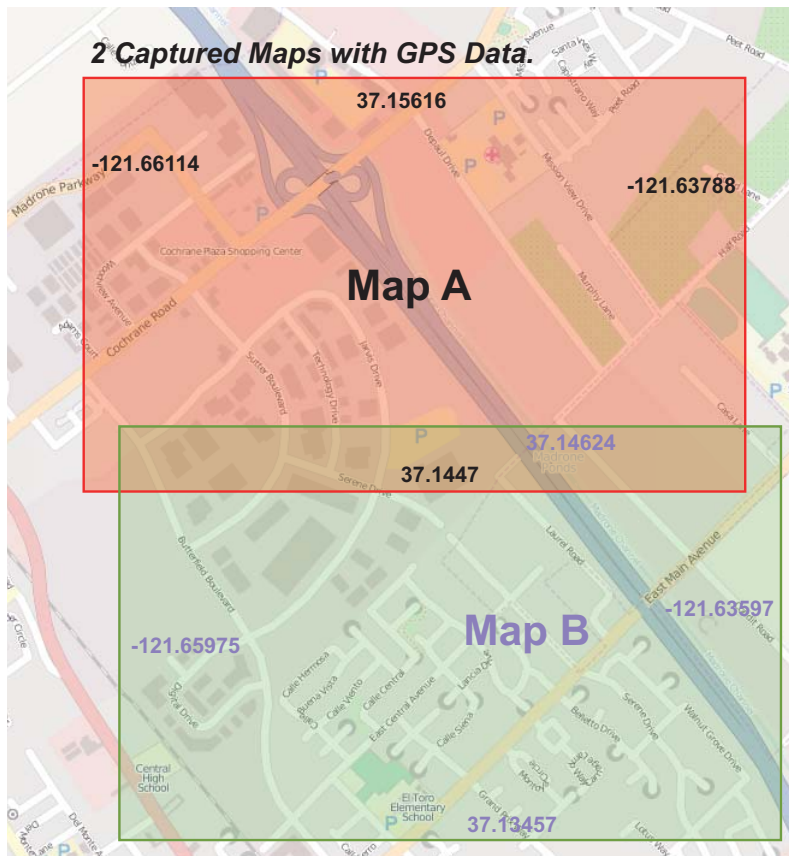
$$\text{Degrees} + \frac{\text{Minutes}}{60} + \frac{\text{Seconds}}{3600} = \text{DD.dddddd}$$

**Note** Remember to enter location information for the borders of the map, not your current location.

10. In the File pull-down menu, select Save or Save As to save the file to a USB flash drive. The file will be needed in the next section, “Instrument Settings” on page 3-13.

**Note** A USB flash drive is required to transfer maps to the instrument.

Figure 3-8 is an example of two overlapping maps from a mapping service with GPS data for the border of each map.

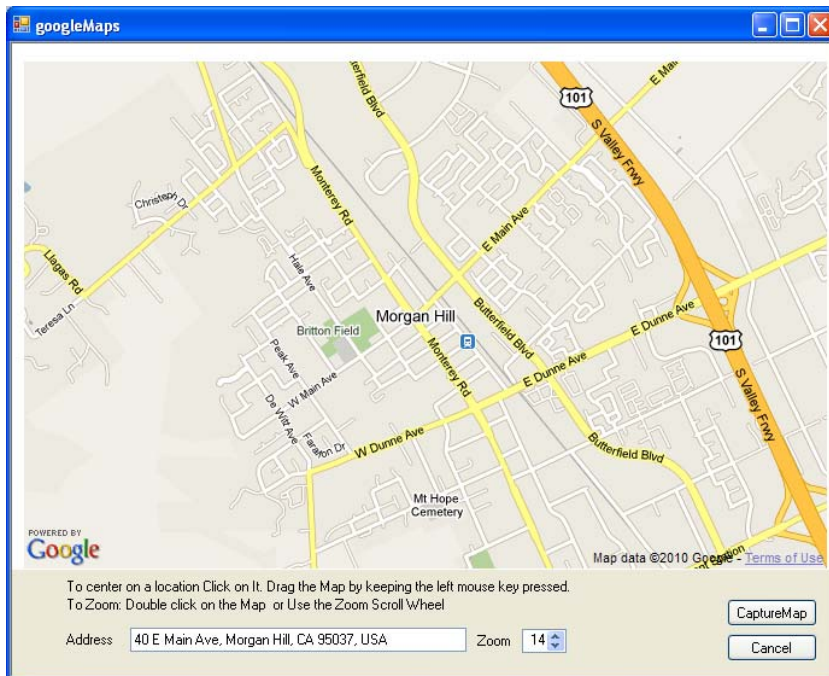


**Figure 3-8.** Overlapping Captured Maps with Border GPS Data

**Note** Map Master can open and modify GPS data in existing .map files.

**Method 2:** Typing in an address in Map Master and capturing the map with GPS data.

1. Launch the Anritsu Map Master application.
2. Click on the Capture Map pull-down menu then select Google Maps.
3. Enter a street address in the address field.
4. Zoom in or zoom out with the arrow keys, typing in the Zoom box or double-clicking the left or right mouse button (Figure 3-9).



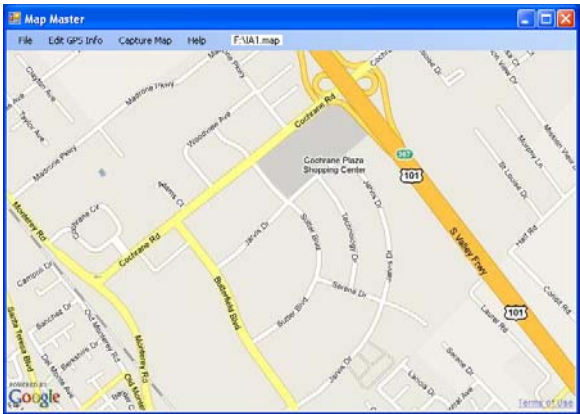
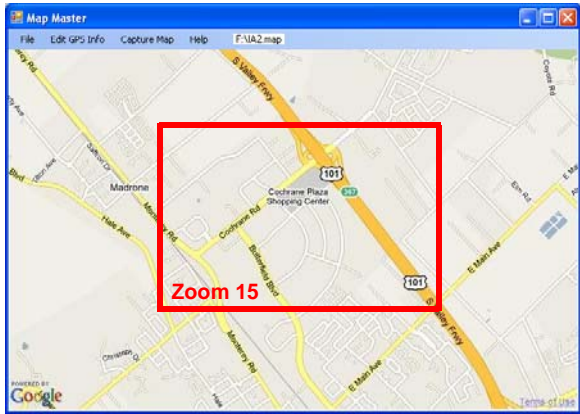

**Figure 3-9.** Capturing a Map Using a Street Address

5. Click on the Capture Map button. in the bottom-right corner.
6. In the File pull-down menu, select Save or Save As to save the file to a USB flash drive. The file will be needed in the next section, “Instrument Settings” on page 3-13.

**Note** A USB flash drive is required to transfer maps to the instrument.

7. Select Yes in the Geo Map dialog box to save the file with GPS information.
8. Repeat step 2 through step 7 for any additional maps or zoom levels.
9. The GPS information can be viewed or edited from the Edit GPS Info pull-down menu (Figure 3-7).
10. Creating and saving .map files of the same address at several zoom levels will be helpful in the field when your location is off the current view or the vectors cross outside of the current map displayed on the instrument. Table 3-1 lists the map area at several zoom levels. Notice from the examples that zooming in a level with Anritsu Map Master reduces the map dimensions by half while zooming out a level doubles the map dimensions.

**Table 3-1.** Map Coverage at Different Zoom Levels

Zoom Level	Map Dimensions	Sample Map
15	1 mile x 1.5 miles (1.5 square miles)	
14	2 miles x 3 miles (6 square miles)	
13	4 miles x 6 miles (24 square miles)	

## Instrument Settings

### Setup

1. Create the appropriate map with Anritsu Map Master. Refer to [“Anritsu Map Master” on page 3-9](#).
2. Open up the Interference Analyzer by pressing the **Menu** key and selecting the Interference Analyzer icon or press **Shift** then **Mode** (9), highlight Interference Analysis and press **Enter**.
3. Press the **Measurements** main menu key then press the Interference Mapping submenu key twice to display the Interference Mapping menu.
4. Turn on GPS.
  - a. Press **Shift** then **System** (8).
  - b. Press the GPS submenu key.
  - c. Connect a GPS antenna to the SMA connector.
  - d. Turn on GPS. On should be underlined in the GPS submenu key.
  - e. Press GPS info and verify that the information from three or more satellites is captured. Press **Esc** to close the info box.

It may take several minutes for the GPS receiver to track at least three satellites. When it does the GPS icon at the top of the screen will turn green. Refer to the User Guide for your instrument for additional information about GPS.

### Recall a Map

The instrument allows you to recall a .map file (created with Anritsu Map Master). With a valid GPS signal the current location will be displayed on the map or an arrow will show the direction of the current location if it is outside the map coverage area.

Connect the USB flash drive that has the map file or files created in [“Anritsu Map Master” on page 3-9](#) to the instrument.

1. Press the **IA Mapping** main menu key at the bottom of the screen.
2. Press the Save/Recall Points/Map submenu key.
3. Press Recall a Map and select the appropriate map from the USB flash drive.
4. Use the arrow keys to scroll down to the desired map and press **Enter** to select.
5. The new map file will be displayed and the current location (if within the GPS boundaries of the displayed map) is shown as a cross.
6. If the current location is outside the map boundaries, a dark red arrow will indicate the direction of the current location in relation to the displayed map.

**Note**

If you do not see the USB drive in the Recall menu:

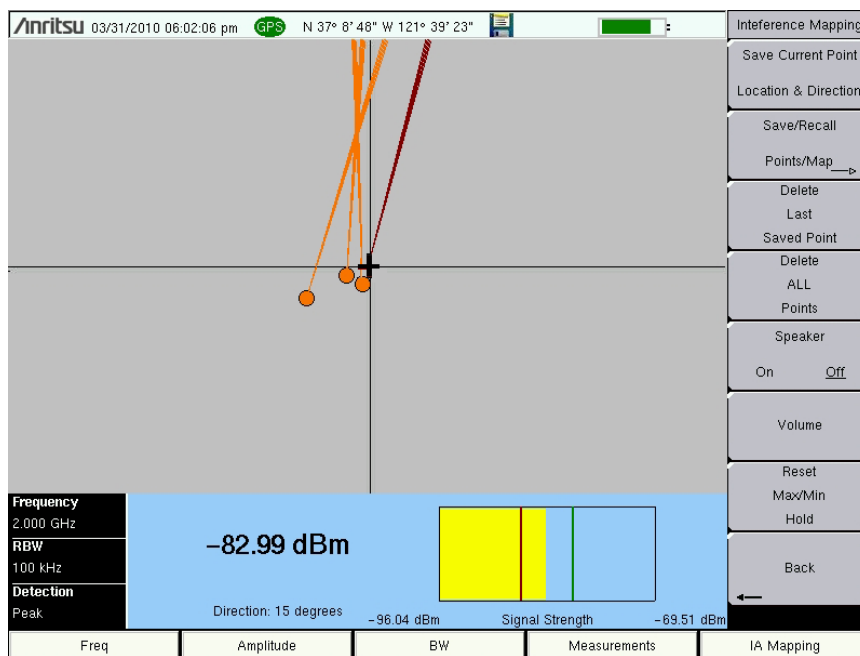
1. Press the Refresh Directories key.
2. If the drive is still not visible, remove and then reconnect the USB flash drive.
3. Reformat the USB flash drive and copy the map files to the reformatted drive.

### Recall the Default Grid

With a valid GPS signal, the instrument is able to make interference mapping measurements even when an Anritsu Map Master file of the current location is not available. Location, signal strength, and bearing information will be saved in a (.kml) file. Details of each time the Current Point Location & Direction submenu key was pressed can be viewed at a later time on the instrument or in Google Earth. Refer to [“Mapping Save/Recall Menu” on page 3-46](#) for additional information on recalling saved maps and .kml data.

**Note** When using the default grid the coverage area for Interference Mapping is fixed at 10 miles by 10 miles. The location will be centered on the default map. If you go to the east by 15 miles, then there will be an arrow indicating where you went off the map. You can at this point load a new Default Grid and the current location will be at the center of the display.

1. Press the **IA Mapping** main menu key at the bottom of the screen.
2. Press the **Save/Recall Points/Map** submenu key.
3. Press the **Recall Default Grid** submenu key.



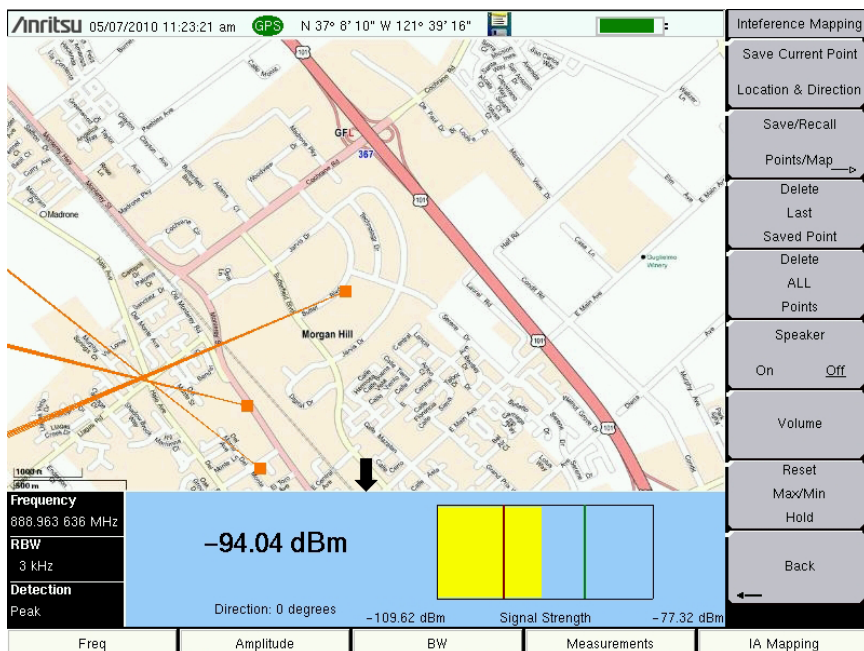
**Figure 3-10.** Locating an Interfering Signal with the Default Grid



## Locate the Interfering Signal

Once you have the GPS signal, directional antenna, and the GeoEmbedded map or the default grid map loaded on instrument, you can start locating interfering signals. The cross shows the current location on the screen.

1. Press the **Measurements** main menu key then the **Spectrum** submenu key.
2. Press the **Freq** main menu key and enter the frequency of the interfering signal using the **Center Freq** submenu key.
3. Connect the directional antenna to the RF In port.
4. Press the **Measurements** main menu key then the **Interference Mapping** submenu key.
5. Press the **Interference Mapping** submenu key again to open the **Interference Mapping** menu. Use the directional antenna to locate the bearing of the strongest signal. Rotate the knob until the red line on the display is aligned with the direction of the interfering signal. Press the **Save Current Point Location & Direction** submenu key to save the location and direction.
6. Move to the next location and repeat step 5. You now have two lines on the screen and an idea of where the interfering signal is located.
7. An arrow is shown when your current location is outside the map (**Figure 3-11**).



**Figure 3-11.** Arrow Indicating Current Location is Off the Map

### Note

A compass may be helpful to determine the bearing of the strongest Antenna signal. Use the rotary knob on the instrument to match the direction (shown at the bottom of the display) of the vector on the screen to the compass bearing of the strongest signal before pressing the **Save Current Point Location & Direction** submenu key.

## Save the Interference Information

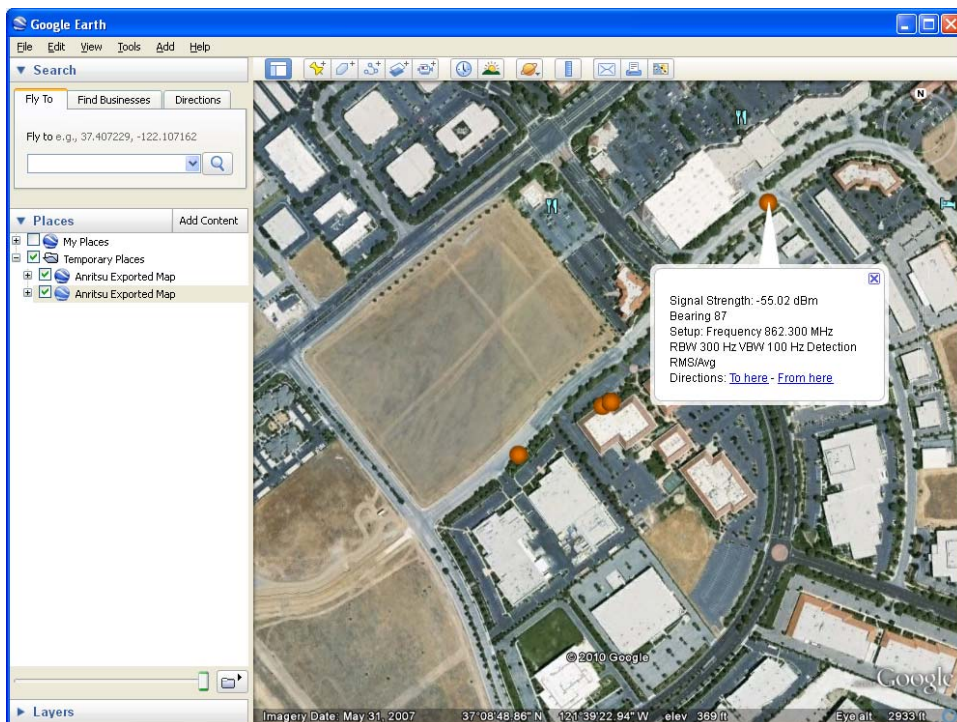
There are three save options in Interference Mapping: “Save KML Points”, “” on page 3-17 or “Save JPG” on page 3-17.

### Save KML Points

Press Save/Recall Points/Map then Save KML Points. At the Save menu, press **Enter**. The following information is saved for the points and vectors currently displayed on the screen:

- Signal strength (dBm)
- Bearing
- Setup (frequency, RBW, VBW, and detection type)
- Current location

The .kml file can be opened and viewed with Google Earth (<http://earth.google.com/>) and also recalled and viewed on the Instrument. Refer to “Mapping Save/Recall Menu” on page 3-46 for additional information.



**Figure 3-12.** Interference Mapping KML File in Google Earth

#### Note

All files will be stored in the default save location. To change the default location, Press **Shift** then **File (7)** to enter File menu. Press Save then press Change Save Location. Create a new folder or use the rotary knob or **Up/Down** arrows to highlight the desired location then press Set Location to make this the new default location for saving files.

### Installing Google Earth

1. Go to the web site: <http://earth.google.com/>.
2. Click Download Google Earth and follow the on-screen instructions.
3. After download, install Google Earth on your computer.
4. Double-click on the saved .kml file to view the measurements Google Earth.

#### Note

After Google Earth is opened, user instructions and several types of help are available from the Help pull-down menu.

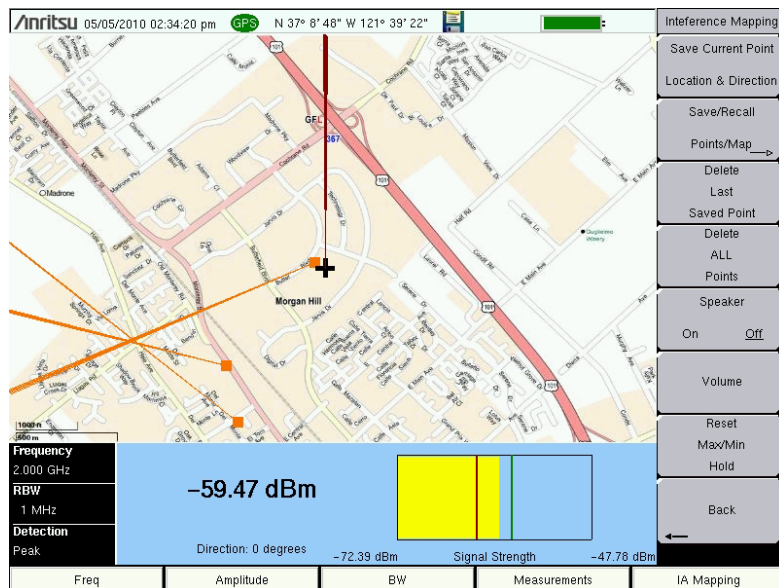
Saved .kml files can not be viewed directly from the instrument using Google Earth, the files need to be first copied to a USB memory stick.

### Save Tab Delimited Points

Press Save/Recall Points/Map then Save Tab Delimited Points. At the Save menu, press **Enter**. A tab delimited text file (.mtd) will be saved to the current location for the points and vectors currently displayed on the screen.

### Save JPG

Press Save/Recall Points/Map then Save Jpg. At the Save menu, press **Enter**. A .jpg file of the current screen will be saved.



**Figure 3-13.** Interference Mapping Saved as a .jpg File

**Note** The point and vector data can be saved in multiple formats.

### 3-9 Interference Analyzer (IA) Menus

Figure 3-14 through Figure 3-20 show the map of the Interference Analyzer menus. The following sections describe IA main menus and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.

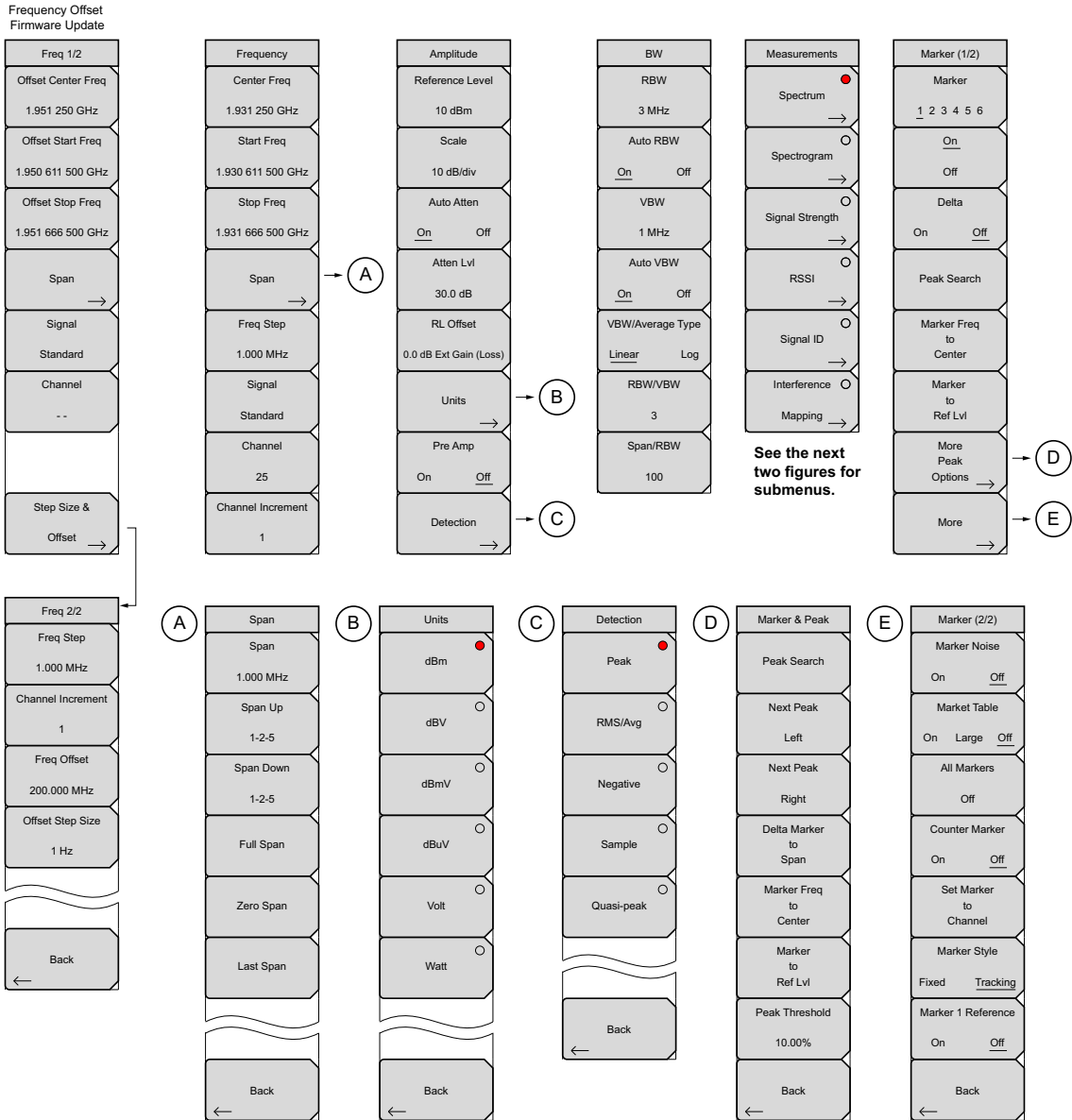


Figure 3-14. Main Menu Keys

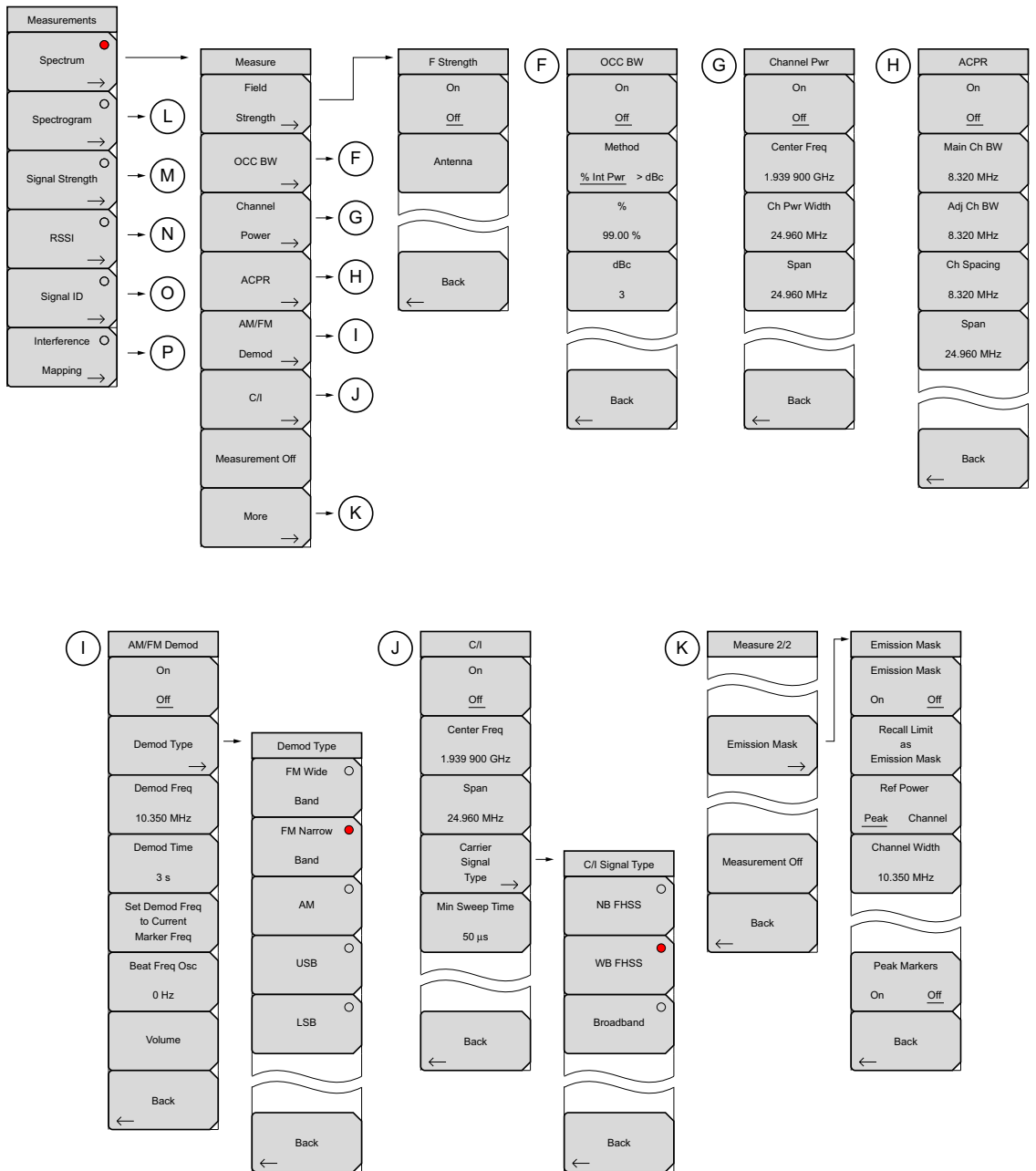


Figure 3-15. Measurements Menu Keys (1 of 2)

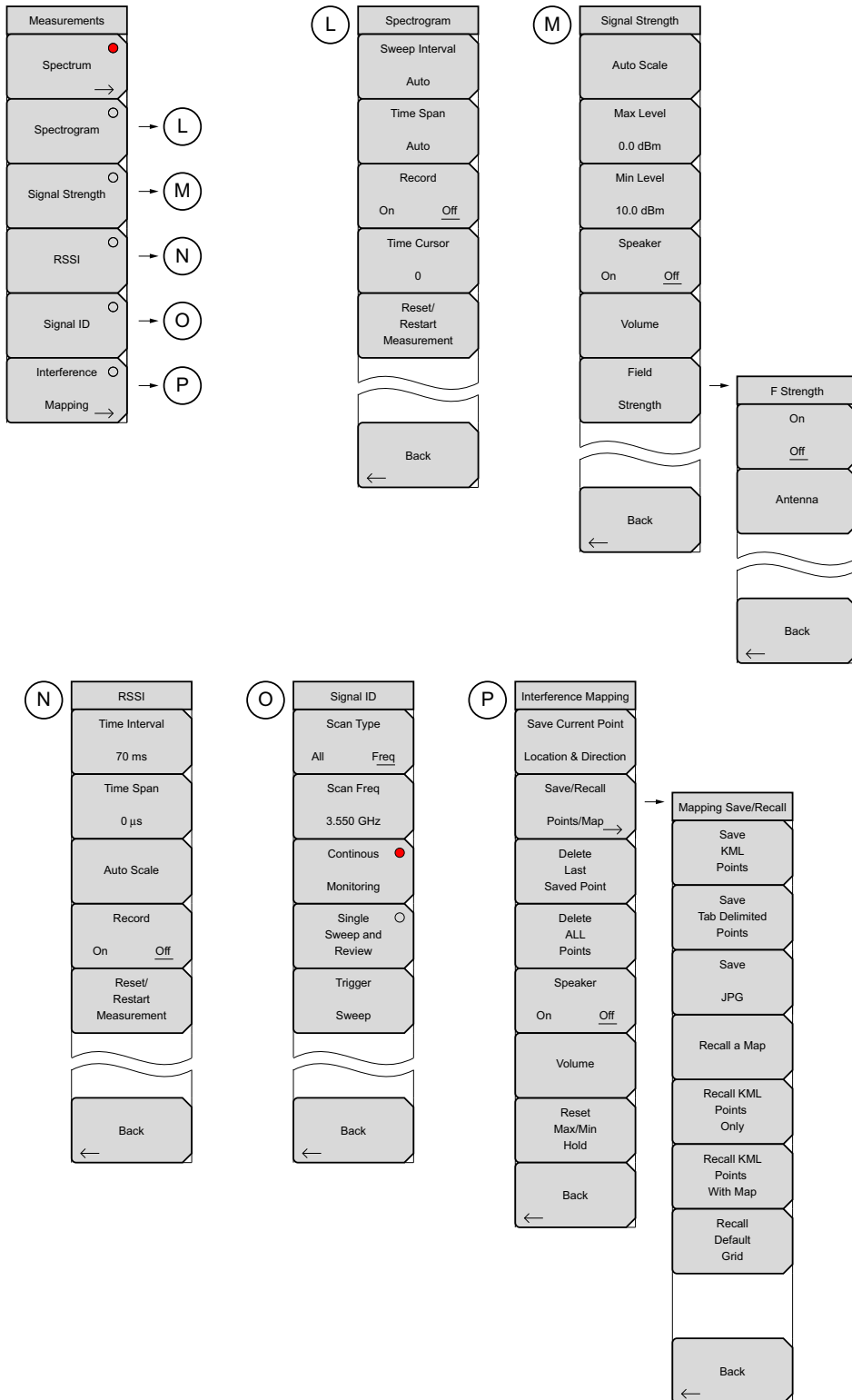


Figure 3-16. Measurements Menu Keys (2 of 2)

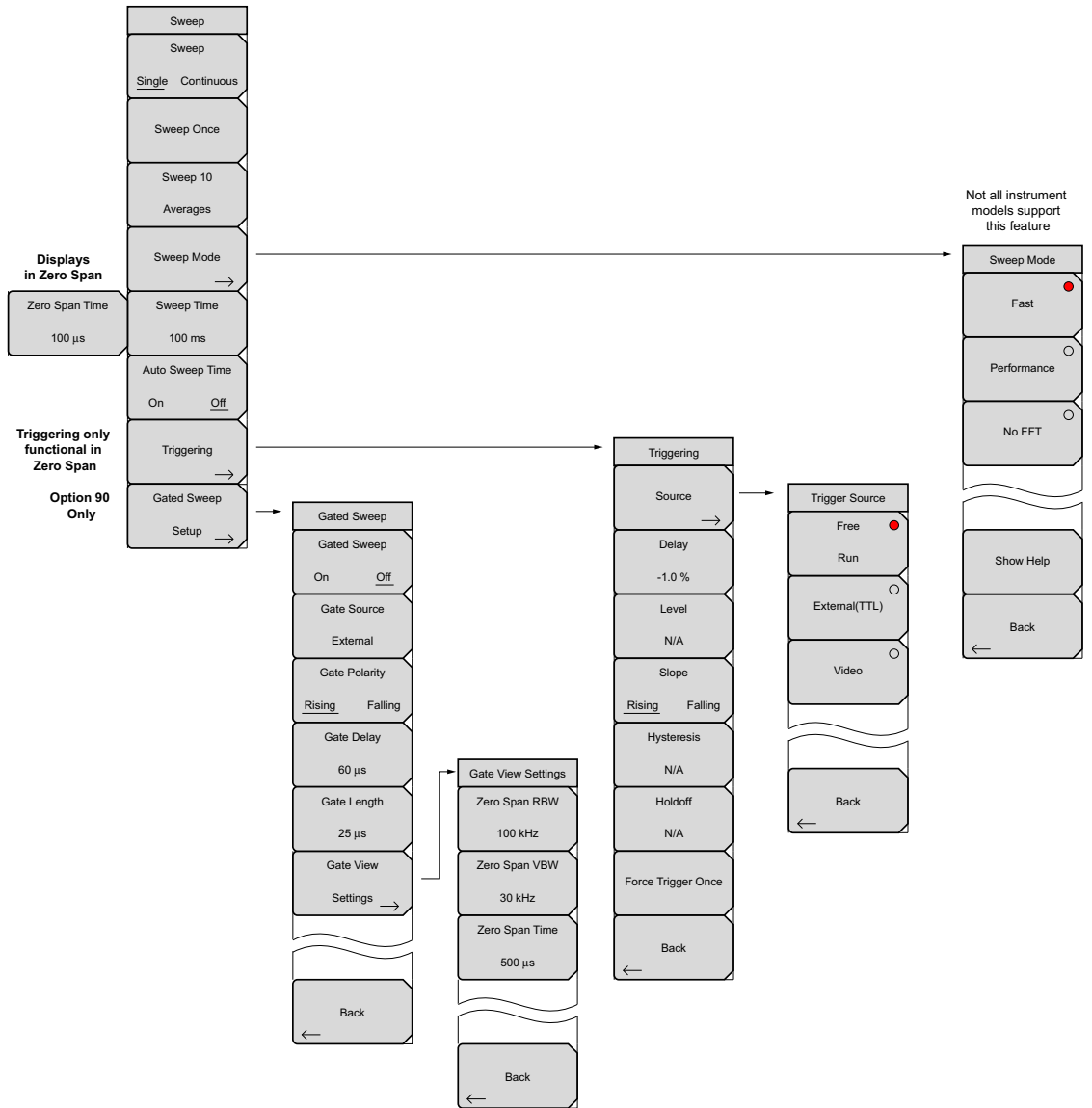


Figure 3-17. Sweep Submenu Keys

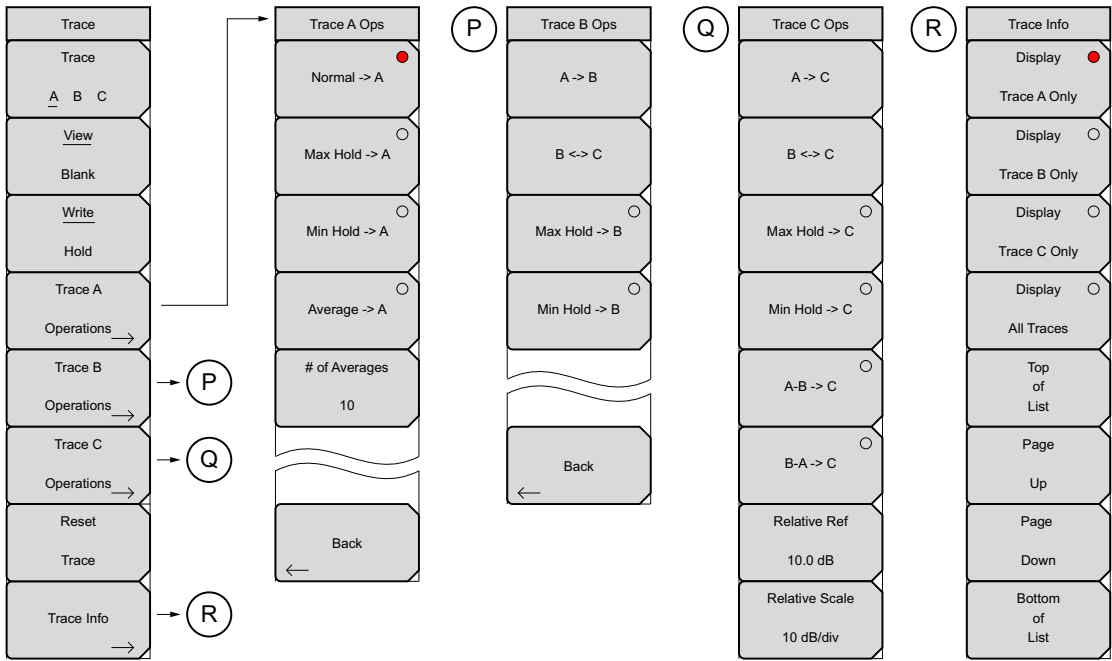


Figure 3-18. Trace Submenu Keys

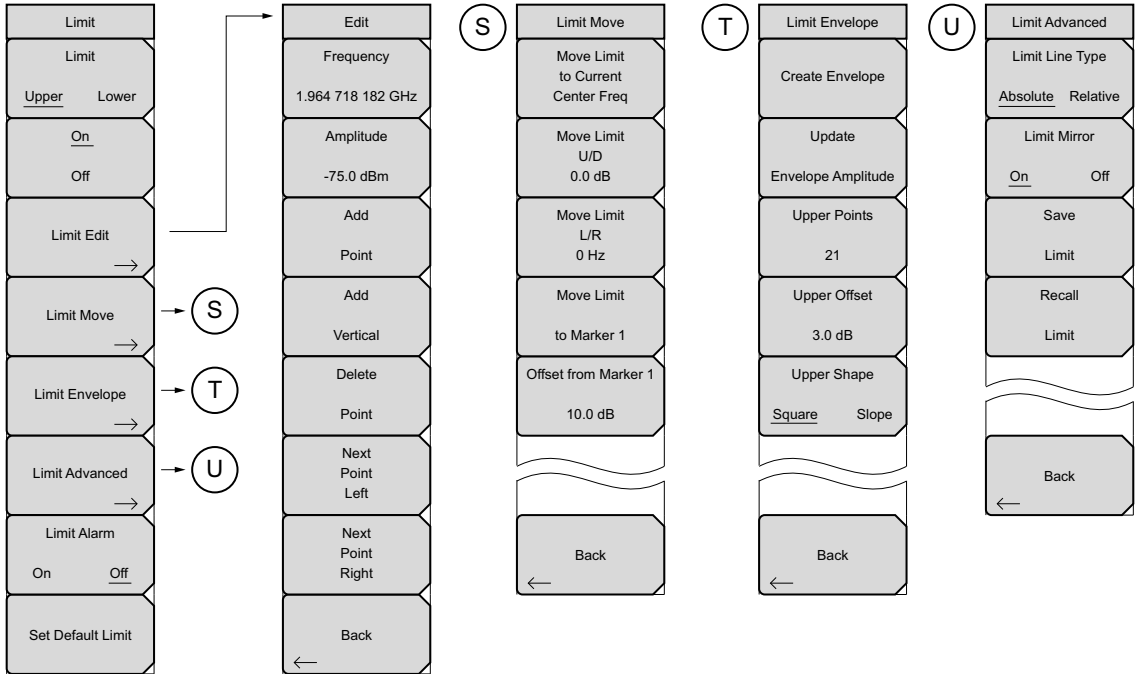
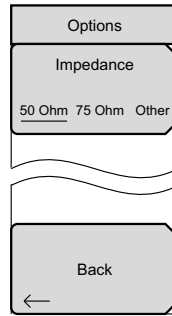


Figure 3-19. Limit Submenu Keys





**Figure 3-20.** System Menu, Application Options Submenu Keys

## 3-10 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.

### Note

Refer to [“Frequency Menu with Offset Function” on page 3-26](#) if your instrument firmware supports frequency offset (bottom submenu is Step Size & Offset).

Frequency
Center Freq 1.931 250 GHz
Start Freq 1.930 611 500 GHz
Stop Freq 1.931 666 500 GHz
Span →
Freq Step 1.000 MHz
Signal Standard
Channel 25, 0.0 kHz
Channel Increment 1

**Center Freq:** Press the **Freq** main menu key followed by the Center Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If entering a frequency using the keypad, the submenu key labels change to GHz, MHz, kHz, and Hz. Press the appropriate units key. Pressing the **Enter** key has the same affect as the MHz submenu key.

**Note:** When using the up and down arrows, the frequency moves in steps defined by the value entered using the Freq Step submenu key. When using the left or right arrow keys, the frequency of the active parameter moves by 10% of the current frequency span. If the instrument is in zero span, the left and right arrows do nothing. Turning the rotary knob changes the active frequency parameter in increments of one display point for each click of the knob. There are 551 display points across the screen.

**Start Freq:** Press the **Freq** main menu key followed by the Start Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a start frequency higher than the current stop frequency is entered, the stop frequency will be changed to yield a 10 Hz span.

**Stop Freq:** Press the **Freq** main menu key followed by the Stop Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a stop frequency lower than the current start frequency is entered, the start frequency will be changed to yield a 10 Hz span.

**Span:** Press the **Freq** 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 product will support. See the product specifications for the maximum frequency. Span can also be set to zero 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 1-2-5 steps for each key press. See [“Span Menu” on page 3-29](#).

**Figure 3-21.** IA Frequency Menu (1 of 2)

## Freq (Frequency) Menu (Continued)

Frequency	<p><b>Freq Step:</b> Press the <b>Freq</b> main menu key followed by the Freq Step submenu key to enter the desired frequency step size. The frequency step specifies the amount by which a frequency will change when the <b>Up/Down</b> arrow keys are pressed. The center frequency, start frequency, and stop frequency values can be changed using Freq Step. The active parameter will be changed by the frequency step when the <b>Up/Down</b> arrow keys are pressed. The frequency step size can be any value from 1 Hz to upper limit of the instrument with a resolution of 1 Hz. The frequency step value can be used to change start frequency, stop frequency, center frequency, and the frequency step size.</p> <p>Use the keypad or the rotary knob to change the Frequency Step size.</p> <p><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.</p> <p>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.</p> <p><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. The frequency value is the amount by which the center frequency differs from the center of the channel.</p> <p><b>Channel Increment:</b> Sets the increment value for the Channel # submenu key.</p>
Center Freq 1.931 250 GHz	
Start Freq 1.930 611 500 GHz	
Stop Freq 1.931 666 500 GHz	
Span →	
Freq Step 1.000 MHz	
Signal Standard	
Channel 25, 0.0 kHz	
Channel Increment 1	

**Figure 3-22.** IA Frequency Menu (2 of 2)

## 3-11 Frequency Menu with Offset Function

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. A user defined frequency offset can be entered to adjust the frequency displayed on the instrument from the actual swept frequency. When enabled **Offset** will be displayed at the bottom of the screen (Figure 3-25) and the **Center Freq**, **Start Freq**, and **Stop Freq** keys will indicate that a frequency offset has been turned on.

Set the **Freq Offset** to 0 Hz to remove the frequency offset.

**Note** The **Freq Offset** will affect the displayed values of **Frequencies**, **Markers** and **Limits**. The currently frequency offset value is displayed in the “**Freq 2/2 Menu**”.

Freq 1/2
(Offset) Center Freq 1.930 500 GHz
(Offset) Start Freq 1.830 500 GHz
(Offset) Stop Freq 2.030 500 GHz
Span →
Signal Standard
Channel --
Step Size & Offset →

**(Offset) Center Freq :** Press the **Freq** main menu key followed by the (Offset) Center Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If entering a frequency using the keypad, the submenu key labels change to GHz, MHz, kHz, and Hz. Press the appropriate units key. Pressing the **Enter** key has the same affect as the MHz submenu key.

**(Offset) Start Freq:** Press the **Freq** main menu key followed by the (Offset) Start Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a start frequency higher than the current stop frequency is entered, the stop frequency will be changed to yield a 10 Hz span.

**(Offset) Stop Freq:** Press the **Freq** main menu key followed by the (Offset) Stop Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a stop frequency lower than the current start frequency is entered, the start frequency will be changed to yield a 10 Hz span.

**Span:** Press the **Freq** main menu key followed by the Span submenu key and enter the desired span. See “[Span Menu](#)” on page 3-29.

**Signal Standard:** Use the **Up/Down** arrow keys or the rotary knob to highlight a signal standard and press **Enter** to select.

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.

**Channel #:** Use the **Up/Down** 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. The frequency value is the amount by which the center frequency differs from the center of the channel.

**Step Size & Offset:** Opens the “[Freq 2/2 Menu](#)” on page 3-27.

**Figure 3-23.** IA Freq 1/2 with Offset Function Menu

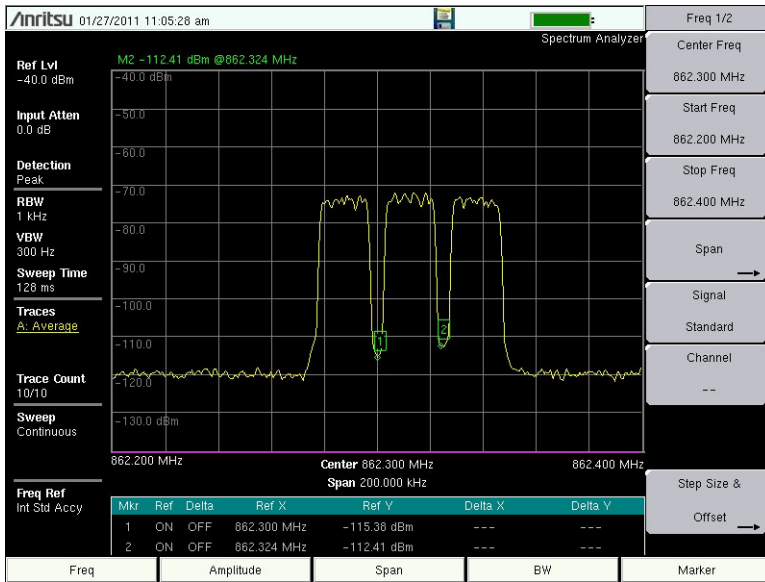
## Freq 2/2 Menu

Key Sequence: **Freq** > Step Size & Offset

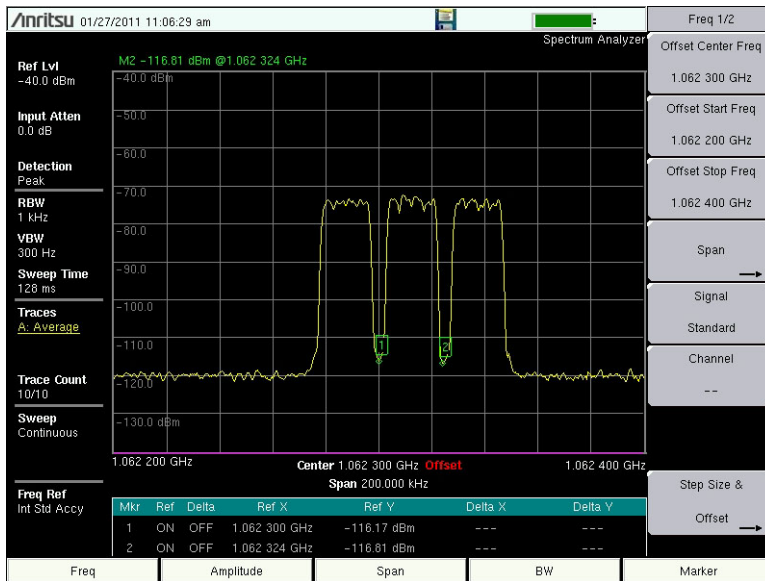
Freq 2/2	<p><b>Freq Step:</b> Press the <b>Freq</b> main menu key followed by the Freq Step submenu key to enter the desired frequency step size. The frequency step specifies the amount by which a frequency will change when the <b>Up/Down</b> arrow keys are pressed. The center frequency, start frequency, and stop frequency values can be changed using Freq Step. The active parameter will be changed by the frequency step when the <b>Up/Down</b> arrow keys are pressed. The frequency step size can be any value from 1 Hz to upper limit of the instrument with a resolution of 1 Hz. The frequency step value can be used to change start frequency, stop frequency, center frequency, and the frequency step size.</p> <p>Use the keypad or the rotary knob to change the Frequency Step size.</p> <p><b>Channel Increment:</b> Sets the increment value for the Channel # submenu key.</p> <p><b>Freq Offset:</b> Enter the desired offset (positive or negative) using the keypad, the arrow keys, or the rotary knob. If 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.</p> <p><b>Offset Step Size:</b> Enter the desired frequency offset step size. The offset frequency step specifies the amount by which the offset frequency will change when the <b>Up/Down</b> arrow keys are pressed.</p> <p>Use the keypad or the rotary knob to change the Offset Step Size.</p> <p><b>Back:</b> Returns to the <a href="#">“Frequency Menu with Offset Function” on page 3-26.</a></p>
Freq Step 1.000 MHz	
Channel Increment 1	
Freq Offset 200.000 MHz	
Offset Step Size 1 Hz	
Back ←	

**Figure 3-24.** SPA Freq 2/2 Menu Offset Function

Example of Frequency Offset Using the Same Source Signal



No Offset



+200 MHz Frequency Offset  
 (Freq > Step Size & Offset > Freq Offset)

Figure 3-25. 200 MHz Frequency Offset Example

## Span Menu

Press the Span submenu key to access the 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.

Key Sequence: **Freq** > **Span**

Span	<p><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. If the span is changed by using the up and down arrow keys, the span changes by the value of the Frequency Step entered in the <a href="#">“Freq (Frequency) Menu” on page 3-24</a>.</p> <p><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.</p> <p><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.</p> <p><b>Full Span:</b> Pressing this button sets the span to cover the entire frequency range of the unit.</p> <p><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 usable area while the instrument records the amplitude using slow sweep.</p> <p><b>Last Span:</b> This submenu key returns the span to the most recent span value immediately before a change was made.</p> <p><b>Back:</b> Returns to the previous menu</p>
Span 1.000 MHz	
Span Up 1-2-5	
Span Down 1-2-5	
Full Span	
Zero Span	
Last Span	
Back ←	

**Figure 3-26.** IA Span Menu

## 3-12 Amplitude Menu

Key Sequence: **Amplitude**

Amplitude	<p><b>Reference Level:</b> The reference level is the top graticule line on the display, and valid reference levels can be set from +30 dBm to –150 dBm. A value may be entered from the key pad, using the ± key as the minus sign. After entering the value press the dBm submenu key or the <b>Enter</b> key. The <b>Up/Down</b> arrow keys change the reference level in 10 dB steps, and the <b>Left/Right</b> arrow keys change the value by 1 dB. The rotary knob changes the value by 0.1 dB per click. The reference level value may be modified by the reference level offset value to compensate for an external attenuator.</p> <p><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.</p> <p><b>Auto Atten On/Off:</b> Input attenuation can be either tied to the reference level (On) or manually selected (Off). When input attenuation is tied to the reference level, attenuation is increased as higher reference levels are selected to make sure the instrument input circuits are not saturated by large signals that are likely to be present when high reference levels are required.</p> <p><b>Atten Lvl:</b> Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.</p> <p><b>RL Offset xx dB Ext Gain/Loss:</b> RL Offset compensates for the presence of external input attenuation or gain. Enter a positive value to compensate for gain or loss and then press the appropriate submenu key (dB External Gain or dB External Loss). The new RL Offset value will be displayed on the button.</p> <p><b>Units:</b> Select the display units from this submenu key: dBm, dBV, dBmV, dBμV, Volt, or Watt Press the Back submenu key to return to the Amplitude menu.</p> <p><b>Pre Amp On/Off:</b> This submenu key turns the low-noise front-end preamplifier on or off. To assure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be &lt; –40 dBm.</p> <p><b>Detection:</b> Several detection methods tailor the performance of the instrument to meet specific measurement requirements. In general, there are more measurement points across the screen than display points. The various detection methods are different ways of dealing with selecting which measurement point will be shown at each display point. Opens the <a href="#">“Detection Menu”</a> on page 3-31.</p>
Reference Level	
10 dBm	
Scale	
10 dB/div	
Auto Atten	
On      Off	
Atten Lvl	
30.0 dB	
RL Offset	
0.0 dB Ext Gain (Loss)	
Units	
→	
Pre Amp	
On <u>Off</u>	
Detection	
→	

Figure 3-27. IA Amplitude Menu



## Detection Menu

Key Sequence: **Amplitude** > Detection

Detection	<b>Peak:</b> This method causes the largest measurement point to be shown for each display point, assuring that a narrow peak is not missed.
Peak <input checked="" type="radio"/>	<b>RMS/Avg:</b> In the Preset case, when the VBW/Average Type is set to Linear, this method detects the average power of sample points that go into the display point. In the case where VBW/Average Type is set to Log, the traditional average of $\log(\text{power})$ is displayed for the detector, as well as for VBW and trace average.
RMS/Avg <input type="radio"/>	<b>Negative:</b> This method causes the smallest measurement point to be shown for each display point. Typically this mode is used to help detect small discrete signals in the presence of nearly equal values of noise. The display points that contain only noise will tend to show lower amplitudes than those that contain discrete signals.
Negative <input type="radio"/>	<b>Sample:</b> This is the fastest detection method because for each display point, only one frequency point is measured. Use this method when speed is of paramount importance and the possibility of missing a narrow peak is not important.
Sample <input type="radio"/>	<b>Quasi-peak:</b> When this selection is made resolution bandwidths and video bandwidths of 200 Hz, 9 kHz and 120 kHz are available. This detection method is designed to meet CISPR requirements.
Quasi-peak <input type="radio"/>	<b>Back:</b> Returns to the <a href="#">“Amplitude Menu”</a> on page 3-30.
Back <input type="radio"/>	
←	

**Figure 3-28.** IA Detection Menu

## 3-13 BW (Bandwidth) Menu

Key Sequence: **BW**

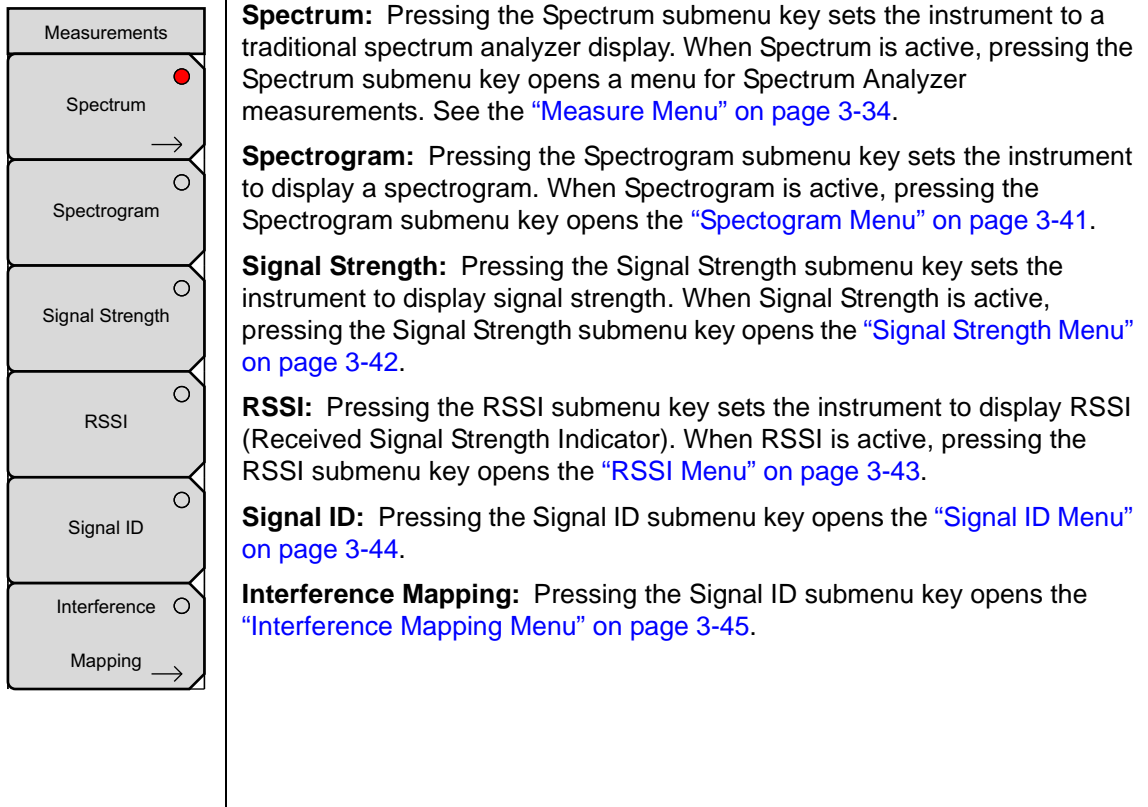
BW	<b>RBW:</b> The current resolution bandwidth value is displayed in this submenu key. The RBW can be changed using the keypad, the arrow keys, or the rotary knob. The range is 10 Hz to 10 MHz in a 1-3 sequence, from 10 Hz to 30 Hz to 100 Hz, and so on.
RBW 3 MHz	Note: Confirm Quasi-peak is not activated in the Detection menu before setting RBW.
Auto RBW <u>On</u> Off	<b>Auto RBW On/Off:</b> When Auto RBW is On, the instrument selects the resolution bandwidth based on the current span width. The ratio of span width to RBW can be specified using the Span/RBW submenu key.
VBW 1 MHz	<b>VBW:</b> The current video bandwidth value is displayed in this submenu key. The VBW can be changed using the keypad, the arrow keys, or the rotary knob. The range is 1 Hz to 10 MHz in a 1-3 sequence.
Auto VBW <u>On</u> Off	<b>Auto VBW On/Off:</b> When Auto VBW is On, the instrument selects the video bandwidth based on the resolution bandwidth. The ratio of video bandwidth to resolution bandwidth can be set using the RBW/VBW submenu key.
VBW/Average Type <u>Linear</u> Log	<b>VBW/Average Type:</b> Toggles between Linear averaging (arithmetic mean) and Logarithmic averaging (geometric mean).
RBW/VBW 3	<b>RBW/VBW:</b> This submenu key displays the ratio between resolution bandwidth and video bandwidth. To change the ratio, press this submenu key and use the keypad, the arrow keys, or the rotary knob to select a new ratio. The default ratio is 3. When the quasi-peak detector is selected the RBW/VBW ratio is changed to 1.
Span/RBW 100	<b>Span/RBW:</b> This submenu key displays the ratio between the span width and the resolution bandwidth. The default value is 100, meaning that the span width is approximately 100 times the resolution bandwidth. The value is approximate because resolution bandwidth filters come in discrete steps while span width can be set to any value up to the limit of the instrument. To change the ratio, press this submenu key and use the keypad, the arrow keys, or the rotary knob to select a new ratio.

Figure 3-29. IA Bandwidth Menu

## 3-14 Measurements Menu

Key Sequence: **Measurements**

**Note** The red circle on the submenu key indicates the currently active measurement.



**Figure 3-30.** IA Measurement Menu

## Measure Menu

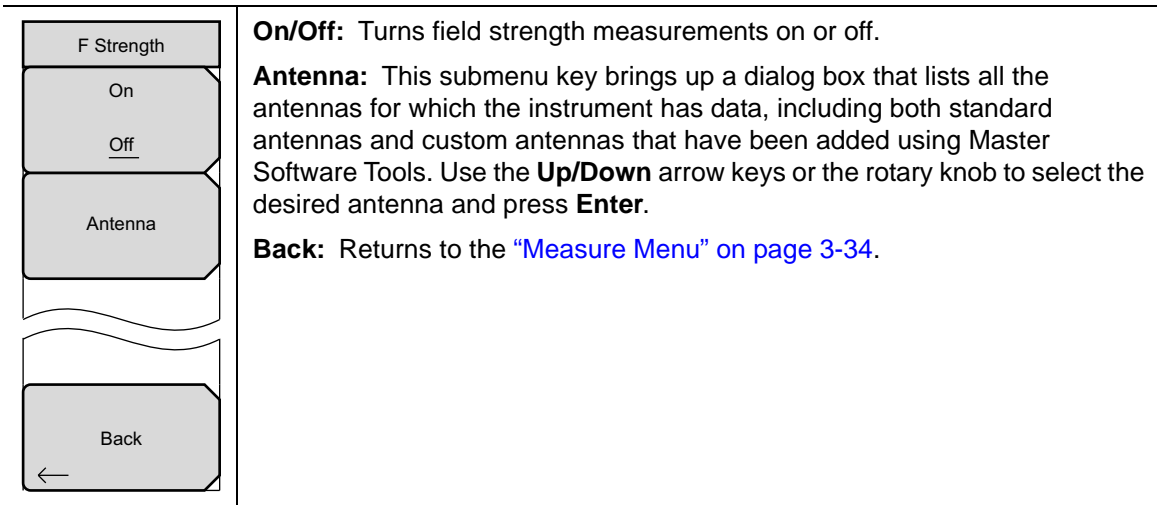
Key Sequence: **Measurements** > Spectrum

Measure	
Field Strength →	<b>Field Strength:</b> This measurement allows the use of an antenna with known gain characteristics and measures the field strength over the frequency range of the antenna in units of dBm/m <sup>2</sup> , dBV/m, dBmV/m, dBμV/m, Volt/m or watts/m <sup>2</sup> . Opens the <a href="#">“Field Strength Menu” on page 3-35</a> .
OCC BW →	<b>OCC BW:</b> Opens the <a href="#">“OCC BW Menu” on page 3-35</a> . Select either % or dBc method of occupied bandwidth measurement.
Channel Power →	<b>Channel Power:</b> Activates the Channel Power measurement function. Opens the <a href="#">“Channel Power Menu” on page 3-36</a> .
ACPR →	<b>ACPR:</b> Accesses a menu of Adjacent Channel Power Ratio measurement options. See the <a href="#">“ACPR Menu” on page 3-37</a> .
AM/FM Demod →	<b>AM/FM Demod:</b> The user can select AM, Narrow Band FM (300 μs de-emphasis), Wide Band FM (50 μs de-emphasis), Upper Sideband or Lower Sideband. See the <a href="#">“AM/FM Demod Menu” on page 3-38</a> .
C/I →	<b>C/I:</b> The Carrier to Interference ratio is a two-step measurement sequence that first measures the amplitude of a carrier, then, with the carrier turned off, measures the amplitude of all other interfering signals within the channel bandwidth. See the <a href="#">“C/I Menu” on page 3-39</a> .
Measurement Off	<b>Measurement Off:</b> Turns the measurement off.
More →	<b>More:</b> Opens the <a href="#">“Measure 2/2 Menu” on page 3-40</a> .

**Figure 3-31.** IA Spectrum Menu

## Field Strength Menu

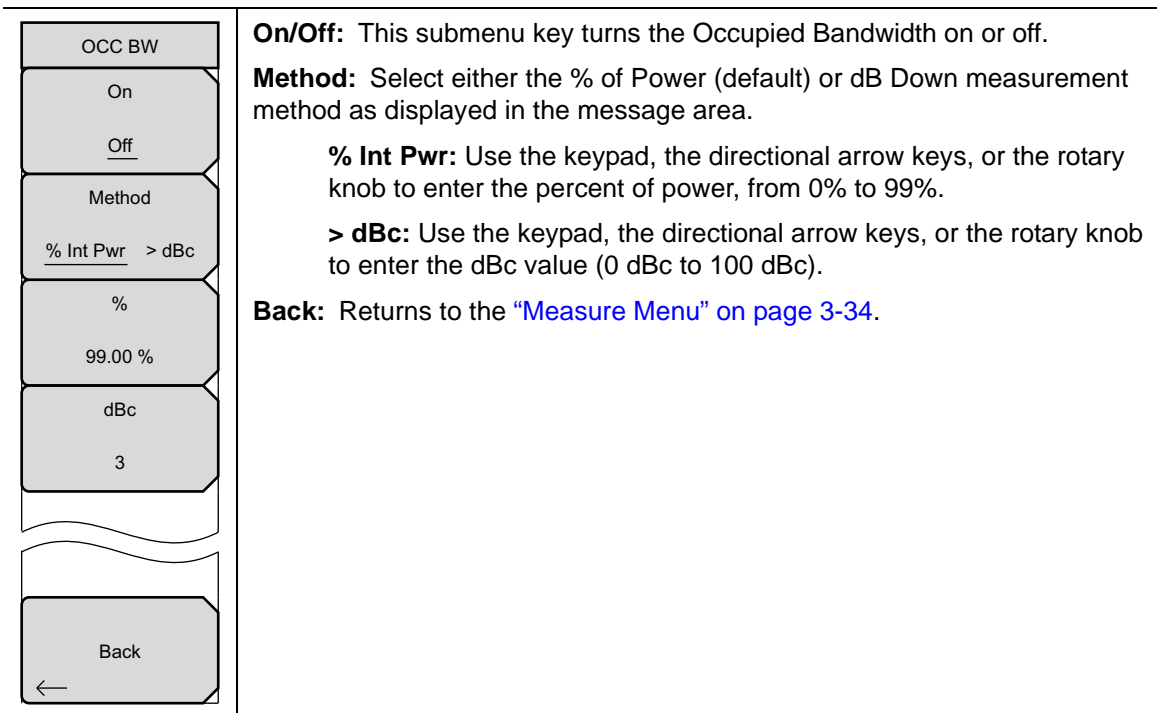
Key Sequence: **Measurements** > Spectrum > Field Strength



**Figure 3-32.** IA Field Strength Menu

## OCC BW Menu

Key Sequence: **Measurements** > Spectrum > OCC BW



**Figure 3-33.** IA OCC BW Menu

## Channel Power Menu

Key Sequence: **Measurements** > Spectrum > Channel Power

Channel Pwr	<b>On/Off:</b> Begins or ends the channel power measurement. When the measurement is on, Ch Pwr will appear below the display. The detection method will automatically be changed to RMS Average when the measurement is started. The detection method can be modified by pressing the <b>Shift</b> and the <b>Sweep</b> keys and pressing the Detection submenu key.
On Off	
Center Freq 1.939 900 GHz	<b>Center Freq:</b> Activates the center frequency function, and sets the center frequency of the instrument for the channel power measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the center frequency. The <b>Up/Down</b> arrows change the frequency by the frequency step size entered in the " <a href="#">Freq (Frequency) Menu</a> ". The <b>Left/Right</b> arrows change the frequency by 10% of the span.
Ch Pwr Width 24.960 MHz	
Span 24.960 MHz	<b>Ch Pwr Width:</b> Sets the width for the channel power. Use the keypad, the directional arrow keys, or the rotary knob to enter the channel power width. The <b>Up/Down</b> arrow keys change the Channel Power Width by the frequency step value. The <b>Left/Right</b> arrow keys change the value by 10% of the span.
~ ~ ~	
Back ←	<b>Span:</b> Sets the span for channel power measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span. <b>Back:</b> Returns to the " <a href="#">Measure Menu</a> " on page 3-34.

**Figure 3-34.** IA Channel Power Menu

## ACPR Menu

Key Sequence: **Measurements** > Spectrum > ACPR

ACPR	<b>On/Off:</b> Begins or ends the ACPR measurement.
On Off	<b>Main Ch BW:</b> Sets the bandwidth of the main channel for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input. Changing this value automatically changes the adjacent channel bandwidth and channel spacing.
Main Ch BW 8.320 MHz	<b>Adj Ch BW:</b> Sets the bandwidth of the adjacent channels for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input.
Adj Ch BW 8.320 MHz	<b>Ch Spacing:</b> Sets the channel spacing between the main and adjacent channels. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input. This value must be greater than or equal to half of the main channel bandwidth, plus half of the adjacent channel bandwidth. The <b>Up/Down</b> arrows change the frequency by the frequency step size entered in the <b>"Freq (Frequency) Menu"</b> . The <b>Left/Right</b> arrow keys change the value by 10% of the span.
Ch Spacing 8.320 MHz	<b>Span:</b> Sets the span for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.
Span 24.960 MHz	<b>Back:</b> Returns to the <b>"Measure Menu"</b> on page 3-34.
Back ←	

**Figure 3-35.** IA ACPR Menu

## AM/FM Demod Menu

Key Sequence: **Measurements** > Spectrum > AM/FM Demod

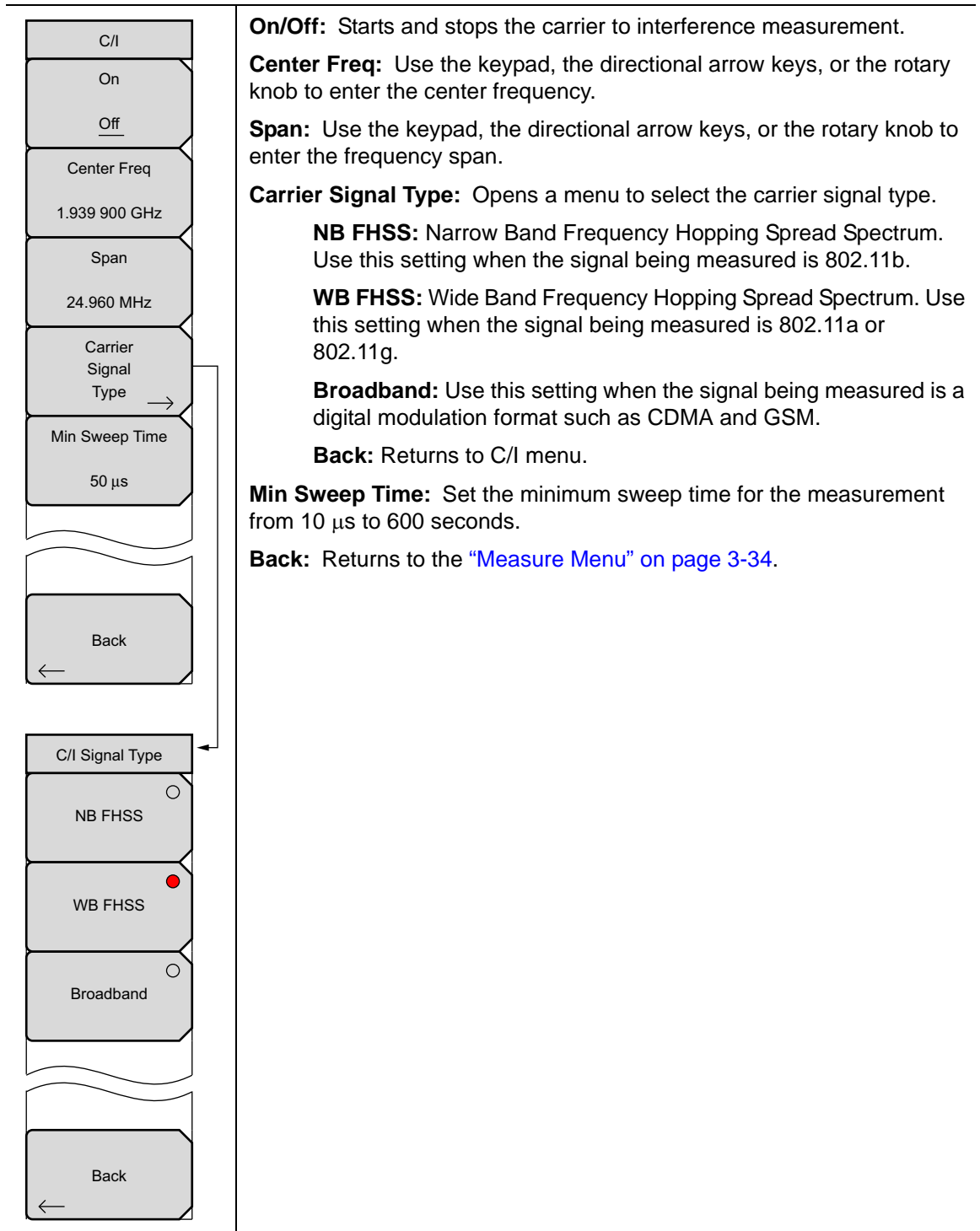
AM/FM Demod	<b>On/Off:</b> Turns AM/FM Demodulation on or off.
On	<b>Demod Type:</b> Provides submenu keys to select the type of signal to be demodulated:
Off	
Demod Type	FM Wide Band
→	FM Narrow Band
Demod Freq	AM
10.350 MHz	USB
Demod Time	LSB
3 s	<b>Demod Freq:</b> Use the keypad, the directional arrow keys, or the rotary knob to enter the center frequency of the signal to be demodulated. This frequency does not have to be within the current frequency sweep range to which the instrument is set.
Set Demod Freq to Current Marker Freq	<b>Demod Time:</b> Use the keypad, the directional arrow keys, or the rotary knob to increase or decrease the demodulation time, and press the <b>Enter</b> key to select. The demodulation time can be set from 100 milliseconds to 200 seconds. The instrument sweeps one time for every demodulation period. Sweeping pauses during the demodulation time.
Beat Freq Osc	<b>Set Demod Freq to Current Marker Freq:</b> Sets the demodulation frequency to the frequency of the current marker.
0 Hz	<b>Beat Freq Osc:</b> Sets the beat frequency of the oscillator to exactly set the demodulation frequency of USB and LSB signals. Displayed when USB or LSB is selected as the Demod Type.
Volume	<b>Volume:</b> The current volume setting is displayed on the screen. Use the <b>Up/Down</b> arrow keys or rotary knob to change the volume, and press the <b>Enter</b> key to select.
Back	<b>Back:</b> Returns to the <a href="#">“Measure Menu” on page 3-34.</a>
←	

**Figure 3-36.** IA AM/FM Demod Menu



## C/I Menu

Key Sequence: **Measurements** > Spectrum > C/I



**Figure 3-37.** IA C/I Menu

## Measure 2/2 Menu

Key Sequence: **Measurements** > Spectrum > More

**Emission Mask:** This submenu controls the setup and display of the emission mask. The spectrum emission mask measurement includes the in-band and out-of-band emissions.

**Emission Mask On/Off:** Turns On/Off the Emission Mask graph and table display.

**Recall Limit as Emission Mask:** Opens a folder of limit lines to select a limit line for use as the Emission Mask.

**Ref Power Peak/Channel:** Press to display the Reference Power as Peak or Channel. When Channel is selected, the Reference Power value is the integral of the individual peaks within the channel.

**Channel Width:** Channel Width is set within the Signal Standard. Use this button to adjust the width as desired.

**Peak Marker On/Off:** Turning on this feature displays a peak marker within an Emission Mask segment. For example, if the Emission Mask had seven segments then there would be seven peak markers. Passing markers are light blue in color while peak markers that exceed the mask limit turn red.

**Back:** Returns to the Measure 2/2 menu.

**Measurement Off:** Turns the measurement off.

**Back:** Returns to the [“Measure Menu” on page 3-34](#).

**Figure 3-38.** IA Measure 2/2 Menu

## Spectrogram Menu

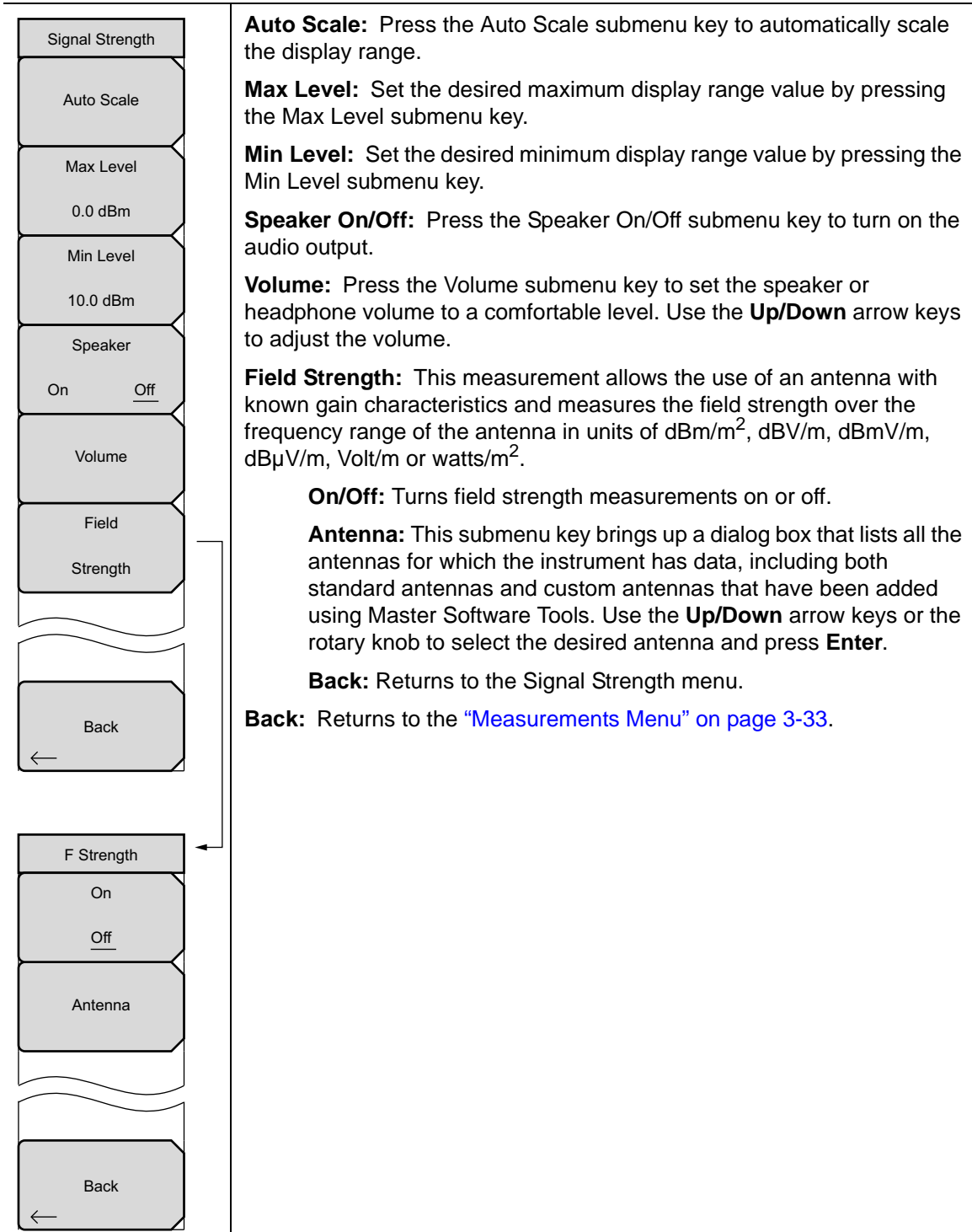
Key Sequence: **Measurements** > Spectrogram

Spectrogram	<b>Sweep Interval:</b> Press the Sweep Interval submenu key and use the rotary knob or keypad to set the time from 0 seconds to 60 seconds.
Sweep Interval Auto	<b>Time Span:</b> To set the total time span for a display, press the Time Span submenu key and use the rotary knob or keypad to enter a time between 1 minute and 4320 minutes (72 hours). When the time span is reached, the measurement stops. When set to zero (Auto) time span, the measurement runs continuously. Entering a time span value causes the corresponding sweep interval value to be automatically computed and shown when the Sweep Interval submenu key is pressed.
Time Span Auto	
Record On      Off	<b>Record:</b> When the Time Span is set to an interval other than Auto, the spectrogram plots will be automatically saved when the waterfall display is full by pressing the Record submenu key.
Time Cursor 0	<b>Time Cursor:</b> The Time Cursor is used to view the spectrum at any spot in the spectrogram display. Press the Time Cursor submenu key to turn on the horizontal time cursor. Use the Up/Down arrow key to move the cursor vertically through the spectrogram. The date and time that the measurement at the cursor position was taken is displayed at the top of the screen.
Reset/ Restart Measurement	<b>Reset/Restart Measurement:</b> Resets or Restarts the measurement.
Back ←	<b>Back:</b> Returns to the <a href="#">“Measurements Menu”</a> on page 3-33.

**Figure 3-39.** IA Spectrogram Menu

### Signal Strength Menu

Key Sequence: **Measurements** > Signal Strength



**Auto Scale:** Press the Auto Scale submenu key to automatically scale the display range.

**Max Level:** Set the desired maximum display range value by pressing the Max Level submenu key.

**Min Level:** Set the desired minimum display range value by pressing the Min Level submenu key.

**Speaker On/Off:** Press the Speaker On/Off submenu key to turn on the audio output.

**Volume:** Press the Volume submenu key to set the speaker or headphone volume to a comfortable level. Use the **Up/Down** arrow keys to adjust the volume.

**Field Strength:** This measurement allows the use of an antenna with known gain characteristics and measures the field strength over the frequency range of the antenna in units of dBm/m<sup>2</sup>, dBV/m, dBmV/m, dBμV/m, Volt/m or watts/m<sup>2</sup>.

**On/Off:** Turns field strength measurements on or off.

**Antenna:** This submenu key brings up a dialog box that lists all the antennas for which the instrument has data, including both standard antennas and custom antennas that have been added using Master Software Tools. Use the **Up/Down** arrow keys or the rotary knob to select the desired antenna and press **Enter**.

**Back:** Returns to the Signal Strength menu.

**Back:** Returns to the ["Measurements Menu"](#) on page 3-33.

**Figure 3-40.** IA Signal Strength Menu

## RSSI Menu

Key Sequence: **Measurements** > RSSI

RSSI	
Time Interval	<b>Time Interval:</b> Press the Time Interval submenu key to set the time between adjacent measurement points. This time may be set from 70 ms to 1 minute.
70 ms	
Time Span	<b>Time Span:</b> Press the Time Span submenu key to set the overall time span for the RSSI measurement. This time can be set from zero, to give manual control of the time span, to a maximum of seven days. After the specified time span, the measurement is halted. Depending upon the time interval selected, the data will scroll to the left once the trace fills the screen.
0 $\mu$ s	
Auto Scale	<b>Auto Scale:</b> Press the Auto Scale submenu key to automatically set the reference level and scale factor to place the trace on the screen.
Record	<b>Record On/Off:</b> To store the RSSI data, press the Record On/Off submenu key to turn on data logging. Each screen full of 551 data points will be stored as a separate display, and can be saved for up to seven days. The unit saves the data in instrument memory and it can be recalled by the Recall submenu key ( <b>File</b> > Recall).
On <u>Off</u>	
Reset/ Restart Measurement	<b>Reset/Restart Measurement:</b> Resets or Restarts the measurement. The RSSI trace is erased and begins anew at the right side of the display.
	<b>Back:</b> Returns to the <a href="#">“Measurements Menu”</a> on page 3-33.
Back	
←	

**Figure 3-41.** IA RSSI Menu

## Signal ID Menu

Key Sequence: **Measurements** > Signal ID

Signal ID	<p><b>Scan Type:</b> The Signal ID feature in the Interference Analyzer can help to quickly identify types of the interfering signals.</p> <p><b>All:</b> Identifies all frequencies within the designated span.</p> <p><b>Freq:</b> Displays the signal data for the selected scan frequency in the Signal ID Results window.</p> <p><b>Scan Freq:</b> Press this submenu key to enter manually a desired center frequency for monitoring.</p> <p><b>Continuous Monitoring:</b> Press this submenu key to continuously sweep across the start and stop frequencies, entered frequency span, or scan frequency.</p> <p><b>Single Sweep and Review:</b> Initially places the Signal ID feature in single sweep mode while making a single sweep for review. For subsequent individual sweeps press the Trigger Sweep submenu key.</p> <p><b>Trigger Sweep:</b> Press this submenu key to trigger another sweep when the Single Sweep and Review submenu key is activated.</p> <p><b>Back:</b> Returns to the <a href="#">“Measurements Menu” on page 3-33</a>.</p>
Scan Type	
All      Freq	
Scan Freq	
3.550 GHz	
Continuous <input checked="" type="radio"/>	
Monitoring	
Single Sweep and Review <input type="radio"/>	
Trigger Sweep	
Back	

**Figure 3-42.** IA Signal ID Menu

## Interference Mapping Menu

Key Sequence: **Measurements** > Interference Mapping

Interference Mapping	<b>Save Current Point Location &amp; Direction:</b> Pressing this button saves the location and direction of the current point and direction setup on the screen. The direction is indicated by the dark red line. This can be rotated around the current location with the rotary knob.
Save Current Point Location & Direction	<b>Save/Recall Points/Map:</b> Opens the <a href="#">“Mapping Save/Recall Menu” on page 3-46.</a>
Save/Recall Points/Map →	<b>Delete Last Saved Point:</b> This deletes the last saved point and direction from the screen.
Delete Last Saved Point	<b>Delete All Points:</b> Clears the screen of all the points and directions currently displayed.
Delete ALL Points	<b>Speaker:</b> Sounds a tone based on received signal strength. Off mutes the speaker.
Speaker	<b>Volume:</b> Adjust the volume when the Speaker submenu key is On.
On <u>Off</u>	<b>Reset Max/Min Hold:</b> The lower and upper limit in the graph are adjusted and updated continuously to display the highest and lowest values. Press this button to reset the Max and Min values.
Volume	<b>Back:</b> Returns to the <a href="#">“Measurements Menu” on page 3-33.</a>
Reset Max/Min Hold	
Back ←	

**Figure 3-43.** IA Interference Mapping Menu

## Mapping Save/Recall Menu

Key Sequence: **Measurements** > Interference Mapping > Save Current Point Location & Direction

Mapping Save/Recall	
Save KML Points	<p><b>Save KML Points:</b> Press this button to save the KML points. FileName.kml will be stored in the selected location. From the File menu, press Save then Change Save Location to change default location. The .kml file can be opened with Google Earth to view the measurements.</p>
Save Tab Delimited Points	<p><b>Save Tab Delimited Points:</b> Press this button to save the points and vectors in a tab delimited text file. FileName.mtd will be stored in the selected location. The file can be opened with Microsoft Excel to view the measurements.</p>
Save JPG	<p><b>Save JPG:</b> Press the Save JPG key to save a JPG file of the current display.</p>
Recall a Map	<p><b>Recall a Map:</b> Opens the Recall menu for selecting a map created with the Anritsu Map Master program to display on the screen.</p>
Recall KML Points Only	<p><b>Recall KML Point:</b> Open the Recall menu for selecting a .kml file. Displays the saved point locations and directions overlaid on the default grid.</p>
Recall KML Points With Map	<p><b>Recall KML Points With Map:</b> Opens the Recall menu for selecting a .kml file. If you already have a geo referenced map or a default grid map, press this key to recall previously stored KML points. This is useful if you made measurements earlier without the appropriate maps and would like to now view a map file with the saved point locations and directions displayed on top of the map.</p>
Recall Default Grid	<p><b>Recall Default Grid:</b> If you do not have a GPS embedded map but are out in the field making measurements and would like to save the KML points, the Recall Default Grid submenu key allows you to save the points and the corresponding GPS coordinates.</p>
Back	<p><b>Back:</b> Returns to the <a href="#">“Interference Mapping Menu”</a> on page 3-45.</p>

**Figure 3-44.** IA Interference Mapping Save/Recall Menu



## 3-15 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 (1/2)	<b>Marker:</b> Selects the active marker (1 to 6). The underlined marker number is the active marker.
Marker <u>1</u> 2 3 4 5 6	<b>On/Off:</b> Turns the selected marker underlined in the Marker key On or Off.
<u>On</u> Off	<b>Delta On/Off:</b> Turns on a delta marker and prompts for a delta offset frequency, either positive or negative from the frequency of the currently active marker.
Delta On <u>Off</u>	<b>Peak Search:</b> This key places the currently active marker on the highest signal amplitude currently displayed on screen.
Peak Search	<b>Marker Freq to Center:</b> Moves the frequency noted by the active marker to the center frequency position and center of the display.
Marker Freq to Center	<b>Marker to Ref Level:</b> Causes the amplitude of the currently active marker to become the reference level, which is the top horizontal line of the display.
Marker to Ref Lvl	<b>More Peak Options:</b> Brings up a secondary menu of submenu keys for more peak searching options. See the <a href="#">“More Peak Options Menu” on page 3-48.</a>
More Peak Options →	<b>More:</b> Opens a submenu of additional Marker options. See the <a href="#">“Marker 2/2 Menu” on page 3-49.</a>
More →	

Figure 3-45. IA Marker (1/2) Menu

## More Peak Options 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	
Next Peak Left	<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 key allows the user to specify the performance of peak searching.
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 key allows the user to specify the performance of peak searching.
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 3-47</a> .

**Figure 3-46.** IA Marker & Peak Menu

## Marker 2/2 Menu

Key Sequence: **Marker > More**

Marker (2/2)	
Marker Noise On <u>Off</u>	<b>Marker Noise On/Off:</b> Turns the markers into noise markers with units of dBm/Hz. When this option is selected, the detection method is automatically changed to RMS and the displayed value is compensated for the noise bandwidth of resolution bandwidth filter.
Marker Table On    Large <u>Off</u>	<b>Marker Table On/Large/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. If Large is selected, a large screen display opens underneath the graph that displays both frequency and amplitude for the active marker in large type.
All Markers Off	<b>All Markers Off:</b> Turns off all markers.
Counter Marker On <u>Off</u>	<b>Counter Marker On/Off:</b> Sets the frequency counter mode for the active marker. Marker frequency values are normally limited in resolution to individual display pixels. Each pixel may represent multiple frequencies. Using Counter Marker in association with Marker to Peak will result in the exact frequency of the peak to a resolution of 0.001 Hz.
Set Marker to Channel	<b>Set Marker To Channel:</b> If a signal standard has been selected, pressing this key brings up a dialog box to select a channel. Select a channel number for the current signal standard, and the active marker will be set to the center frequency of the channel.
Marker Style Fixed <u>Tracking</u>	<b>Marker Style:</b> This key changes the behavior of the reference markers. If Fixed is selected, reference markers stay at the amplitude they were at when the associated delta marker was turned on. If Tracking is selected, the amplitude of the reference marker changes as the signal amplitude is changed. Note that the reference marker tracks the amplitude, not the frequency of a signal.
Marker 1 Reference On <u>Off</u>	<b>Marker 1 Reference:</b> Selects whether Marker 1 is the reference for all six delta markers, or whether each of the six reference markers has an associated delta marker.
Back ←	<b>Back:</b> Returns to the <a href="#">“Marker Menu” on page 3-47</a> .

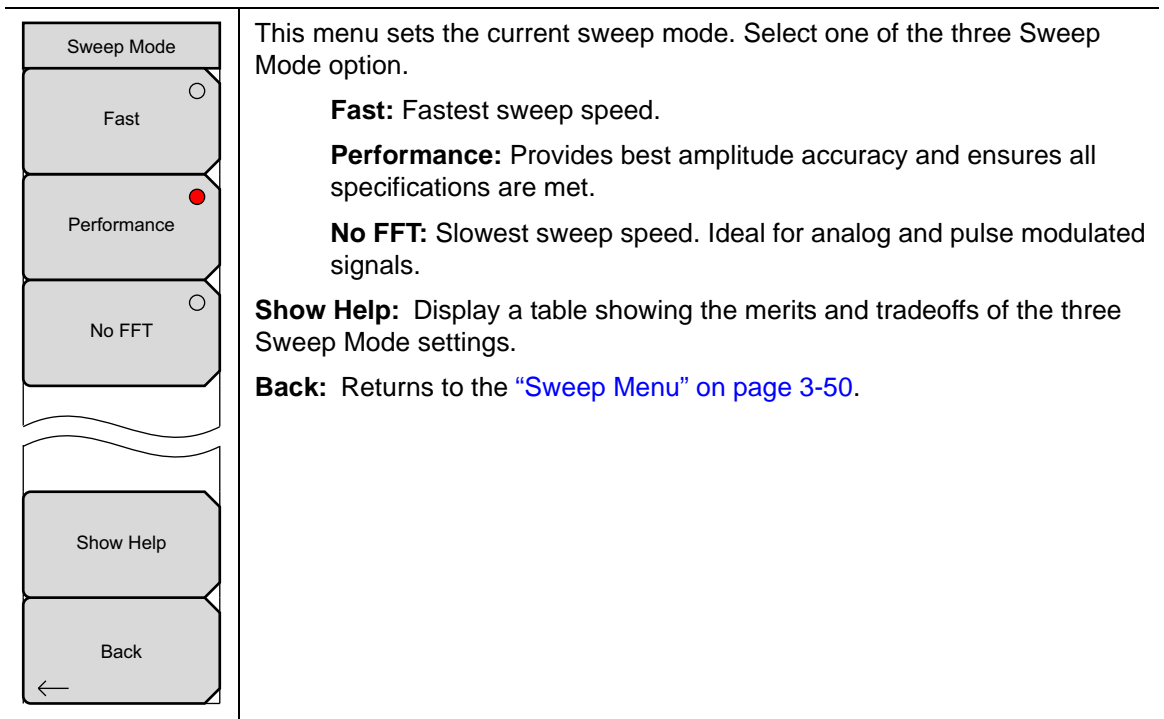
**Figure 3-47.** IA Marker (2/2) Menu

## 3-16 Sweep Menu

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

Sweep	<b>Sweep Single/Continuous:</b> 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 awaits a trigger event to start a new sweep.
Sweep Single Continuous	<b>Sweep Once:</b> When Sweep is set to Single, Sweep Once triggers a single measurement sweep. This key has no function when the instrument is in continuous sweep mode.
Sweep Once	<b>Sweep # Averages:</b> Sweeps the number of times set using the # of Averages button under the Trace A Ops menu. Trace A must be set to Averaging ( <b>Shift &gt; Trace</b> (5) key > Trace A Operations > Average->Trace A) for this menu to function. Each trace is displayed using the exponential average of each sweep.
Sweep 10 Averages	<b>Sweep Mode</b> (Only available on some models): Pressing this submenu key opens the <a href="#">“Sweep Mode Menu (Only available on some models)”</a> on page 3-51.
Sweep Mode →	<b>Sweep Time:</b> Sets the sweep time for the measurement.
Sweep Time 100 ms	<b>Auto Sweep Time:</b> When Off, the measurement sweeps the time set in Sweep Time. When On, the instrument calculates a minimum sweep time and uses it for all subsequent sweeps.
Auto Sweep Time On Off	<b>Triggering:</b> Functional in Zero span only. Displays the <a href="#">“Triggering Menu”</a> on page 3-52.
Triggering →	<b>Gated Sweep Setup</b> (Option 90 Only): For configuring Gated Sweep. Opens the <a href="#">“Gate Setup Menu (Option 90)”</a> on page 3-53.
Gated Sweep Setup →	

Figure 3-48. IA Sweep Menu

**Sweep Mode Menu (Only available on some models)**Key Sequence: **Shift** > **Sweep** (3) key > Sweep Mode**Figure 3-49.** IA Sweep Mode Menu

## Triggering Menu

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

**Source:** Displays the Trigger Source Menu.

**Free Run:** In this mode, a new sweep is started immediately upon completion of an old sweep. No trigger event is required to initiate a sweep.

**External (TTL):** A TTL signal applied to the External Trigger BNC input connector causes a single sweep to occur. This mode is used in zero span, and triggering occurs on the rising edge of the signal. After the sweep is complete, the resultant trace is displayed until the next trigger signal arrives.

**Video:** This mode is used in zero span to set the power level at which a sweep is initiated. The power level can be set from  $-130$  dBm to  $+30$  dBm, using the rotary knob, arrow keys, or keypad. The trigger is based on the measured signal level. If no signal reaches or exceeds the trigger level, there will be no trace on the screen. This mode is used in Zero Span.

**Back:** Returns to the Triggering Menu.

**Delay XX %:** Used when External or Video buttons are activated. Measurement begins after set time delay once the trigger has occurred. The delay can be entered either as a percentage of the sweep time or as an absolute time delay with units of ns,  $\mu$ s or ms.

**Level:** Used when External or Video buttons are activated. Sets a level trigger to initiate a measurement.

**Slope:** Sets the trigger slope to rising or falling.

**Hysteresis:** When used, value unit is in dB. Hysteresis can be used with Level and Slope when setting a measurement trigger. Hysteresis is used to prevent undesired triggering when the signal is hovering near the trigger value. For example, the Level is set to 10 dBm, the Slope is set to Rising, and Hysteresis is 1 dB. The first trigger occurs when the signal at least reaches the 10 dBm level. To trigger again, the signal must drop below 9 dBm before returning to 10 dBm. For another example, with Level set to 10 dBm and slope set to Falling, and Hysteresis set to 1 dB, the opposite must occur to activate a trigger. The signal amplitude falls and a trigger occurs when the signal reaches the 10 dBm level. The signal must then reach at least 11 dBm before falling to 10 dBm and initiating a trigger.

**Holdoff:** Delays the next trigger to the time set regardless of triggers occurring within the set time.

**Force Trigger Once:** Forces a sweep regardless of meeting any trigger criteria.

**Back:** Returns to the “Sweep Menu” on page 3-50.

Figure 3-50. IA Triggering Menu

## Gate Setup Menu (Option 90)

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

Gate Setup	<b>Gated Sweep:</b> Turns the Gated Sweep function On and Off.
Gated Sweep On <u>Off</u>	<b>Gate Source:</b> Gate Source is currently only available using an External trigger signal that can be input using the instrument's Ext Trigger In connector.
Gate Source External	<b>Gate Polarity Rising/Falling:</b> Press to select the desired edge trigger to begin the gated sweep.
Gate Polarity <u>Rising</u> Falling	<b>Gate Delay:</b> Sets the start of the gated sweep indicated by the left border of the blue dashed rectangle shown in the bottom graph of <a href="#">Figure 2-1 on page 2-4</a> .
Gate Delay 60 $\mu$ s	<b>Gate Length:</b> Sets the length of the gate and is reflected on the zero span graph by the width of the blue rectangle as shown in <a href="#">Figure 2-1</a> .
Gate Length 25 $\mu$ s	<b>Gate View Settings:</b> Opens the Gate View Setting submenu. Allows a user to independently change the RBW, VBW and sweep time of the zero span or gate view (bottom graph).
Gate View Settings →	<p><b>Zero Span RBW:</b> Sets the resolution bandwidth of the zero span graph.</p> <p><b>Zero Span VBW:</b> Sets the video bandwidth of the zero span graph.</p> <p><b>Zero Span Time:</b> Sets the sweep time of the zero span graph.</p> <p><b>Back:</b> Returns to the Gate Setup menu.</p>
Back ←	<b>Back:</b> Returns to the <a href="#">"Sweep Menu" on page 3-50</a> and also changes the Gated Sweep Setup view back to the full screen Spectrum view. The Gated Sweep settings are retained and applied to the spectrum.
Gate View Settings	
Zero Span RBW 100 kHz	
Zero Span VBW 30 kHz	
Zero Span Time 500 $\mu$ s	
Back ←	

**Figure 3-51.** IA Gated Sweep Menu

## 3-17 Measure Menu

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

**Note**

This menu is only active when making Spectrum measurements. It is not operational in Spectrogram, Signal Strength, RSSI, Signal ID, or Interference Mapping measurements.

Press the **Measure** key opens the [“Measure Menu” on page 3-34](#).



## 3-18 Trace Menu

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

To access the functions under the Trace menu, press the **Shift** key, then the Trace (5) key. The instrument is capable of displaying up to three traces, one with live data, and the other two either with stored data or trace math data.

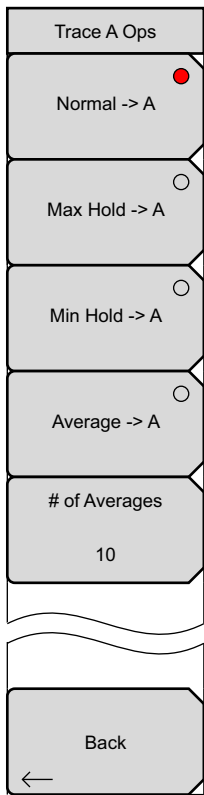
<b>Note</b>	This menu is only active when making Spectrum measurements. It is not operational in Spectrogram, Signal Strength, RSSI, Signal ID, or Interference Mapping measurements.
-------------	---

Trace	<p><b>Trace A, B, C:</b> Sets trace A, B, or C as the active trace. Repeatedly pressing this key toggles through trace A, B, and C. The active trace is underlined.</p> <p><b>View/Blank:</b> Displays or hides the active trace.</p> <p><b>Write/Hold:</b> Selects between holding the current swept trace on the screen or continually sweeping and updating the displayed measurement. This is not applicable to Trace B or Trace C unless trace math involving Trace A is active.</p> <p><b>Trace A Operations:</b> Lists the Trace A Ops menu to select an operation that can be applied to Trace A. See <a href="#">“Trace A Ops Menu” on page 3-56</a>.</p> <p><b>Trace B Operations:</b> Lists the Trace B Ops menu to select an operation that can be applied to Trace B. See <a href="#">“Trace B Ops Menu” on page 3-57</a>.</p> <p><b>Trace C Operations:</b> Lists the Trace C Ops menu to select an operation that can be applied to Trace C. See <a href="#">“Trace C Ops Menu” on page 3-58</a>.</p> <p><b>Reset Trace:</b> Resets the trace averaging, Max Hold and Min Hold, and restarts the sweep.</p> <p><b>Trace Info:</b> Stops the current trace and displays a summary table of trace parameters and current settings. Press <b>Enter</b> to clear the table from the display and restart the trace.</p>
Trace	
<u>A</u> B C	
<u>View</u>	
Blank	
<u>Write</u>	
Hold	
Trace A	
Operations →	
Trace B	
Operations →	
Trace C	
Operations →	
Reset	
Trace	
Trace Info →	

**Figure 3-52.** IA Trace Menu

## Trace A Ops Menu

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



**Normal -> A:** Displays data for the current trace sweep.

**Max Hold -> A:** Shows the cumulative maximum value of each display point over many trace sweeps.

**Min Hold -> A:** Shows the cumulative minimum value of each display point over many trace sweeps.

**Average -> A:** Shows an exponential average of a number of traces, determined by the # of Averages key.

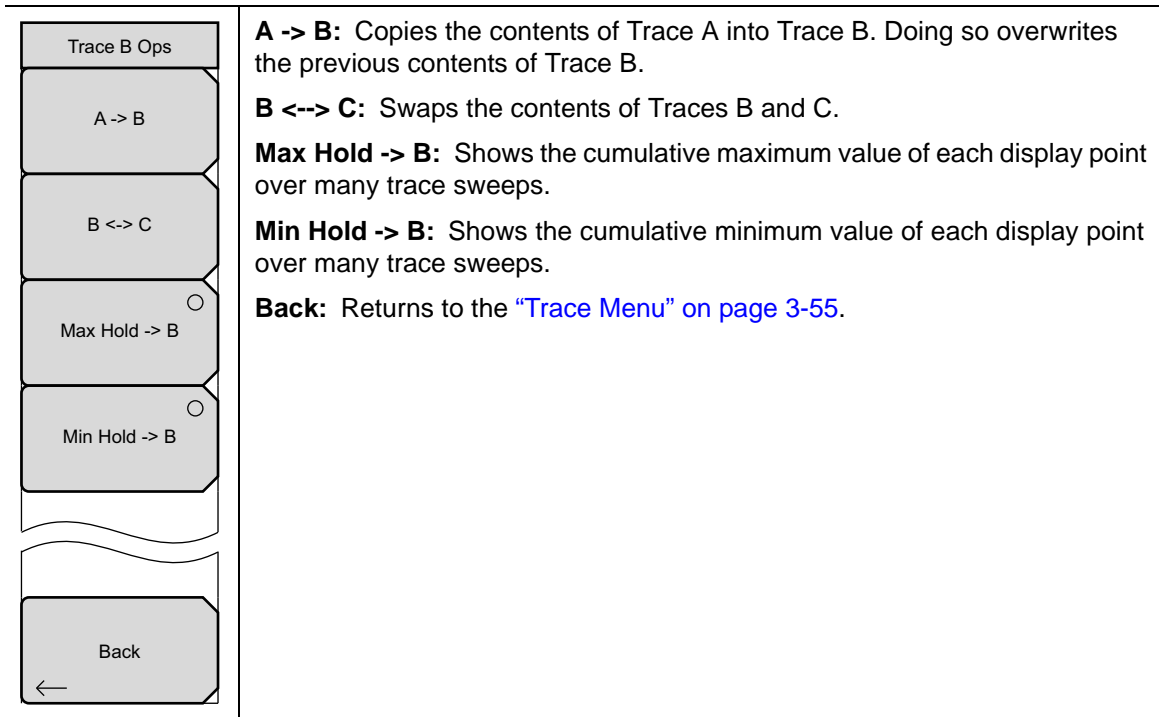
**# of Averages:** Sets the number of traces for use in calculating the average display value. Then number used for averaging ranges from 1 to 65535.

**Back:** Returns to the ["Trace Menu" on page 3-55](#).

**Figure 3-53.** IA Trace A Ops Menu

## Trace B Ops Menu

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



**Figure 3-54.** IA Trace B Ops Menu

## Trace C Ops Menu

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

Trace C Ops	<b>A -&gt; C:</b> Copies the contents of Trace A into Trace C. Doing so overwrites the previous contents of Trace C.
A -> C	<b>B &lt;-&gt; C:</b> Swaps the contents of Traces B and C.
B <-> C	<b>Max Hold -&gt; C:</b> Shows the cumulative maximum value of each display point over many trace sweeps.
Max Hold -> C	<b>Min Hold -&gt; C:</b> Shows the cumulative minimum value of each display point over many trace sweeps.
Min Hold -> C	<b>A - B -&gt; C:</b> Subtracts the value of trace B from trace A and places the results in Trace C. This function is very useful for observing the changes in values of live Trace A compared to a trace stored in Trace B.
A-B -> C	When trace math is active, a relative scale shows on the right side of the graph, and is associated to Trace C. This allows the user to optimize the display of Trace C without affecting the display of Traces A and B.
B-A -> C	<b>B - A -&gt; C:</b> Subtracts the value of Trace A from Trace B and places the results in Trace C. This function is very useful for observing the changes in values of live Trace A compared to a trace stored in Trace B. When trace math is active, a relative scale shows on the right side of the graph, and is associated to Trace C. This allows the user to optimize the display of Trace C without affecting the display of Traces A and B.
Relative Ref	<b>Relative Ref:</b> Sets the value applied to the top graticule for the relative scale that appears on the right side of the graph when trace math is active. Change this value by using the rotary knob, <b>Up/Down</b> arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the <b>Enter</b> key. This entry is valid only when trace math is active
10.0 dB	<b>Relative Scale:</b> Sets the value applied to the scaling of the relative scale that appears on the right side of the graph when trace math is active. Change this value by using the rotary knob, <b>Up/Down</b> arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the <b>Enter</b> key. This entry is valid only when trace math is active.
Relative Scale	
10 dB/div	

To return to the Trace Menu press the **Shift** key and then the **Trace** (5) or press the **Back** key.

**Figure 3-55.** IA Trace C Ops Menu

## 3-19 Limit Menu

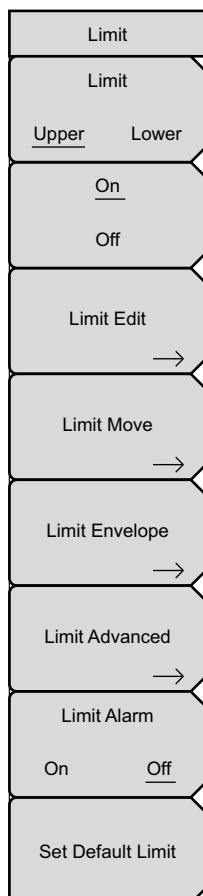
Key Sequence: **Shift > Limit** (6) key

Two types of limit lines can be specified, lower limit lines and upper limit lines. Limit lines can be used for visual reference only, or for pass/fail criteria using the limit alarm (Figure 3-56). Limit alarm failures are reported whenever a signal is above the upper limit line or below the lower limit line. By using save-on-event, a signal that causes a limit alarm can be automatically saved. See the User Guide for details.

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, which allows the configuring of specific limit envelopes at various frequencies of interest without having to re-configure them each time the frequency is changed.

**Note**

This menu is only active when making Spectrum measurements. It is not operational in Spectrogram, Signal Strength, RSSI, Signal ID, or Interference Mapping measurements.



**Limit:** This submenu key selects limit line (Upper or Lower) will be active for editing. The limit line that is currently selected for editing is underlined.

**On/Off:** This submenu key turns the active limit (upper or lower) on or off.

**Limit Edit:** This submenu key displays the “[Edit Menu](#)” on page 3-60 that allows creating or editing of single or multi-segment limit lines. The currently active limit point is marked by a red circle on the display.

**Limit Move:** Display the “[Limit Move Menu](#)” on page 3-62.

**Limit Envelope:** A limit envelope is very useful when you want to easily detect new signals in the presence of other preexisting signals. Use the limit envelope function to automatically create upper or lower limit lines that are based upon the on-screen measured spectrum analysis values. Refer to [Figure 3-61](#) for an example limit envelope. Press this submenu key to open the “[Limit Envelope Menu](#)” on page 3-63.

**Limit Advanced:** Press this submenu key to open the Limit Advanced submenu key menu. The advanced limit line section offers several useful functions. In this section, you can create either an absolute limit line (which is one based upon the frequencies that are entered for each inflection point) or a relative limit line (which is based upon the delta frequencies between the center frequency and the inflection points). Both types of limit lines can be saved and recalled. Press this submenu key to open the “[Limit Advanced Menu](#)” on page 3-65.

**Limit Alarm On/Off:** Pressing this submenu key toggles the alarm function ON and OFF for the currently active limit line. When ON, an alarm beep will occur when a data point exceeds the limit.

**Set Default Limit:** Pressing this submenu key deletes all limit points for the currently active limit line and sets the default limit line value, which is a single limit whose position is 2.5 grid lines from the top of the screen (for the upper limit line) or 2.5 grid lines from the bottom of the screen (for the lower limit line), depending upon which limit is active. The inactive limit line is not altered.

**Figure 3-56.** IA Limit Menu

## Edit Menu

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

Edit	<p><b>Frequency:</b> Press this submenu key to set the frequency of a limit line inflection point. The frequency of each inflection 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 it takes on the stop frequency of the current sweep if no point is 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 an inflection point. The <b>Left/Right</b> arrows move the inflection point by 5% of the span.</p> <p><b>Amplitude:</b> Press this submenu key to set the amplitude of a limit line inflection point. The amplitude of each inflection 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 (using the <math>\pm</math> key to set a negative value), 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 details. The <b>Up/Down</b> arrows move the amplitude by 5% of the screen height.</p> <p><b>Add Point:</b> Press this submenu key to add a limit line inflection point. The precise behavior of this submenu key depends upon which inflection point is active at the time that the key is pressed. If the active limit point is somewhere in the middle of a multi-segment limit line, then a new limit point is added that is halfway between the currently active point and the point immediately to its right. The amplitude of the inflection point will be such that it falls on the limit line. For example, if a limit point exists at 2.0 GHz with an amplitude of <math>-30</math> dBm, and if the next point is 3.0 GHz with an amplitude of <math>-50</math> dBm, then 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.</p> <p>If the last limit point is active (assuming it is not at the right edge of the display), then 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>
Frequency	
1.964 718 182 GHz	
Amplitude	
$-75.0$ dBm	
Add	
Point	
Add	
Vertical	
Delete	
Point	
Next Point Left	
Next Point Right	
Back	
←	

**Figure 3-57.** IA Limit Edit Menu (1 of 2)

## Edit Menu (Continued)

Edit	<b>Add Vertical:</b> In many measurement masks, step changes occur in the value of the limit line. Press this submenu key to add two inflection points. The two inflection points share the same frequency and are centered midpoint between adjacent measured points. The magnitudes of the points are set by using a visually intuitive algorithm that is based upon the adjacent inflection points.
Frequency 1.964 718 182 GHz	
Amplitude -75.0 dBm	
Add Point	You can adjust the magnitudes independently, but the frequencies of the two points remain linked and are adjusted as a vertical pair. Setting a discrete frequency, a limit inflection point will keep that exact frequency and place the limit point appropriately regardless of the frequency span. This is especially useful for emission mask verification.
Add Vertical	<b>Delete Point:</b> Press this submenu key to delete the currently active point. The active point becomes the point that is immediately to the left of the point that was deleted.
Delete Point	<b>Next Point Left:</b> Press this submenu key to select the inflection point that is immediately to the left of the active point, making this newly selected point active for editing or deletion. With each key press, the active point becomes that point to the left of the previously active point, until the newly selected active point becomes the left-most point on the screen.
Next Point Left	<b>Next Point Right:</b> Press this submenu key to select the limit point immediately to the right of the active point, making this newly selected point active for editing or deletion. With each key press, the active point becomes that point to the right of the previously active point, until the newly selected active point becomes the right-most point on the screen.
Next Point Right	<b>Back:</b> Press this submenu key to return to the <a href="#">"Limit Menu" on page 3-59</a> .
Back ←	

Figure 3-58. IA Limit Edit Menu (2 of 2)

## Limit Move Menu

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


Limit Move	<p><b>Move Limit to Current Center Freq:</b> Pressing this submenu key moves the center of the existing limit line to the center frequency of the measurement. The span of the existing limit line is not changed by doing this. Use this submenu key as an easy way to get an existing limit line on screen. If no limit line is turned on, then a new, flat default limit line is turned on and is located 2.5 grid lines from the top of the screen for the upper limit line or 2.5 grid lines from the bottom of the screen for the lower limit line.</p> <p><b>Move Limit ## dB:</b> If the limit line is flat, then use this submenu key to move the limit line to an absolute power point in dBm. If the limit line is not flat, then use this submenu key to move the limit line up or down by the selected number of dB. Use the keyboard to enter the desired value. The entire line moves by the amount that is entered. The limit line can also be moved by using the rotary knob. Turn the rotary knob clockwise to move the line to higher power levels. The <b>Up/Down</b> arrows move the limit line by 5% of the screen height. The <b>Left/Right</b> arrows move the limit line by 0.2% of the screen height or 0.2 dB when the scale is set to 10 dB/division.</p> <p><b>Move Limit ## Hz:</b> Pressing this submenu key allows you to adjust the frequencies of the limit line. All inflection points are moved by the value entered. The rotary knob can also be used to make this adjustment. Turn the rotary knob clockwise to move the limit line to higher frequencies. The <b>Left/Right</b> arrows move the limit line by 5% of the span while the <b>Up/Down</b> arrows move the line by one display pixel.</p> <p><b>Move Limit to Marker 1:</b> Press this submenu key to move the frequency and amplitude of the center frequency of the limit line to the frequency and amplitude of Marker 1 (assuming that the Offset from Marker 1 submenu key is set to 0 dB).</p> <p><b>Offset from Marker 1 ## dB:</b> Press this submenu key to set a limit line offset value from Marker 1 amplitude. This feature moves the limit line amplitude and frequency as needed to place the center of the limit line the user-specified number of dB from the position of Marker 1. Positive values place the limit line above Marker 1, and negative values place the limit line below Marker 1.</p> <p><b>Back:</b> Press this submenu key to return to the <a href="#">“Limit Menu” on page 3-59</a>.</p>
Move Limit to Current Center Freq	
Move Limit U/D 0.0 dB	
Move Limit L/R 0 Hz	
Move Limit to Marker 1	
Offset from Marker 1 10.0 dB	
Back ←	

Figure 3-59. IA Limit Move Menu



## Limit Envelope Menu

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

	<p><b>Create Envelope:</b> Press this submenu key to generate the envelope using the Limit Envelope characteristics. If the default results are not satisfactory, then you can make adjustments to the amplitude and frequency of each inflection point, and you can add or delete inflection points.</p> <p><b>Update Envelope Amplitude:</b> While working on your envelope (or if your signal amplitude changes), you may want to adjust the amplitude of the current limit without changing the frequencies of the inflection points. Pressing this submenu key makes those amplitude adjustments without frequency adjustments.</p> <p><b>Upper Points</b> (if Upper Limit is selected)  <b>Lower Points</b> (if Lower Limit is selected): Use this submenu key to define how many inflection points you want for the selected upper or lower limit envelopes. The value can be between 2 and 41. Note that the upper and lower limit lines do not need to have the same number of points.</p> <p><b>Upper Offset</b> (if Limit is toggled to Upper)  <b>Lower Offset</b> (if Limit is toggled to Lower): This submenu key is used to define how far away from the measured signal the upper or lower envelope will be placed. The limits are <math>\pm 100</math> dB. For an upper envelope, usually the value will be positive in order to place the envelope above the signal. For a lower envelope, the value will usually be negative in order to place the envelope below the signal.</p> <p><b>Upper Shape</b> (if Limit is toggled to Upper)  <b>Lower Shape</b> (if Limit is toggled to Lower): Press this submenu key to choose whether the default for the upper or lower envelope will be with flat tops (Square setting) and reasonably vertical lines to change level or whether the envelope will have sloped lines (Slope setting) between adjacent inflection points. When the square envelope type is selected, two inflection points are used for each horizontal segment. You can toggle between a square envelope and a sloped envelope by pressing this submenu key. <a href="#">Figure 3-61</a> is an example of a Square Limit Envelope.</p> <p><b>Back:</b> Press this submenu key to return to the “Limit Menu” on <a href="#">page 3-59</a>.</p>
--	--

**Figure 3-60.** IA Limit Envelope Menu

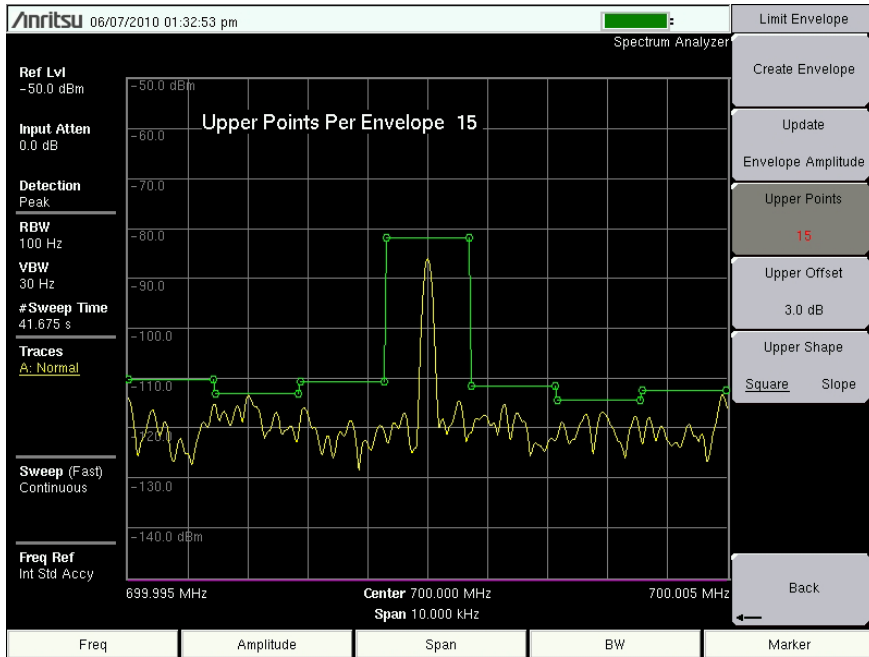


Figure 3-61. Square Limit Envelope

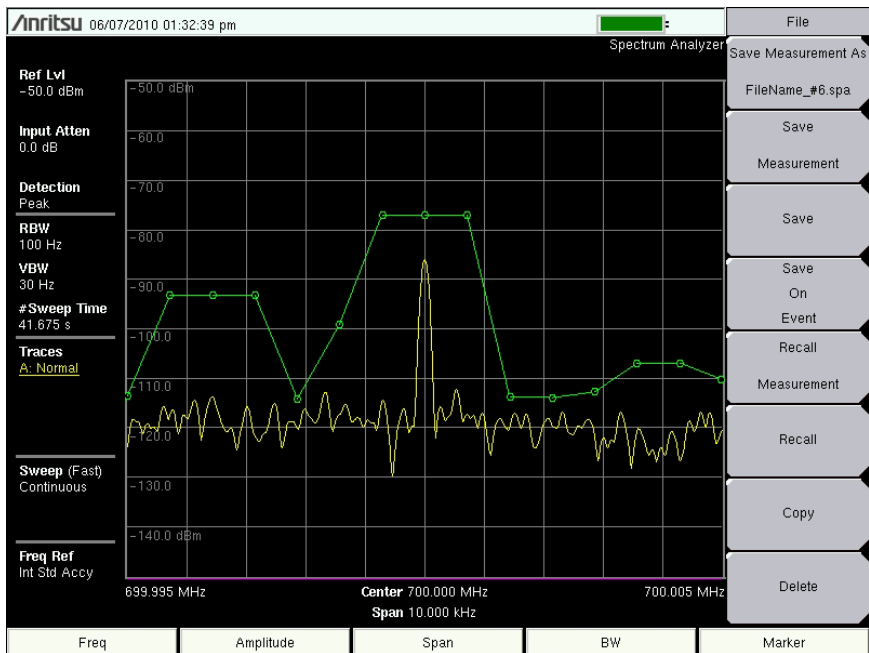
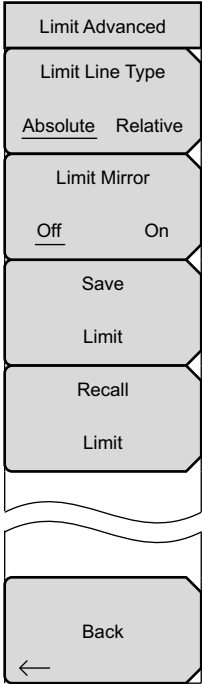


Figure 3-62. Sloped Limit Envelope

## Limit Advanced Menu

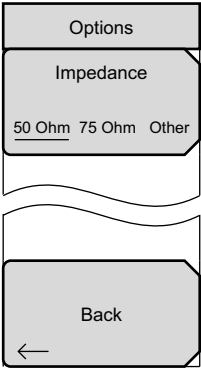
Key Sequence: **Shift** > **Limit** (6) key > Limit Advanced

	<p><b>Limit Line Type:</b> Press this submenu key to choose to have either limit line be absolute or be relative. This submenu key may be used at any time while working with limit lines. Absolute limit lines set the limit inflection points based upon the entered frequencies for each point. Relative limit lines set the limit inflection points relative to the current center frequency. Regardless of how a limit line is set up, saved, or recalled, it can be changed between absolute and relative by toggling with this submenu key.</p> <p><b>Limit Mirror On/Off:</b> Press this submenu key to turn the Limit Mirror feature On and Off.</p> <p>Many emission masks are symmetrical. The low frequency side is identical to the upper side. The Limit Mirror feature allows you to create half of the limit line and get the other half built automatically. This feature can work in either of two ways:</p> <p style="padding-left: 40px;">Turn Limit Mirror on before beginning to build a limit line. As you add a point on either side of the center frequency, another point is automatically added on the opposite side of the center frequency.</p> <p style="padding-left: 40px;">Leave Limit Mirror off until half of the limit line is built, then turn On Limit Mirror. the other half of the limit line is built automatically.</p> <p><b>Save Limit:</b> Pressing this submenu key opens a dialog to save the current upper and lower limit lines. You can name the saved limit line yourself or accept the name that is suggested by the instrument (which is based upon a previously saved name). If you did not intend to save the limit line, then press Esc to stop the dialog and avoid saving the limit line.</p> <p><b>Recall Limit:</b> Pressing this submenu key opens a dialog box to recall a saved limit line. The dialog box presents a list of saved limit lines. Highlight the desired limit line and press <b>Enter</b>. If you decide not to recall a limit line, then press Esc to stop the dialog.</p> <p>If the saved limit is a relative limit, then it is recalled centered about the current center frequency. If the saved limit is an absolute limit, then it is recalled to the frequency at which it was created.</p> <p>If you recall an absolute limit, and if it is off screen, then you will see the left or right limit off-screen indicator on the edge of the screen.</p> <p><b>Back:</b> Press this submenu key to return to the <a href="#">“Limit Menu” on page 3-59</a>.</p>
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**Figure 3-63.** IA Limit Advanced Menu

## 3-20 Application Options

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



**Impedance 50 Ohm 75 Ohm Other:** Select either 50 ohm, 75 ohm, or Other impedance value. Selecting 75 ohm selects the 7.5 dB loss of the Anritsu 12N50-75B adapter. For other adapters, select Other and enter the appropriate loss.

**Back:** Press this submenu key to return to the previous menu.

**Figure 3-64.** IA Application Options

## 3-21 Other Menus

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

# Chapter 4 — Channel Scanner (Option 27)

<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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## 4-1 Introduction

This chapter presents Channel Scanner information and procedures. The Channel Scanner option (Option 27) measures the signal power of multiple transmitted signals. The power can be displayed as either a bar graph or a text display showing the channel power of selected channels for a given air interface standard, or the manually entered channels. Up to 20 channels can be measured.

The operating frequency range for Channel Scanner mode can either be set manually, or the desired air interface standard can be selected from the Signal Standard and channel list in the instrument. When the channels are selected from the Signal Standard list, all frequency related parameters for the standard are automatically set to the appropriate values. The frequency and bandwidth settings can be manually entered using the Scan Frequencies selection if none of the available air interface standards meet the measurement need. A custom channel list can also be created to allow up to 20 independent channels to be defined.

With the use of Master Software Tools, Script Master extends the test capabilities of channel scanner testing of the instrument. Features include the use of a Script Master Test Setup File to set test parameters, extending the number of channel scans to 1200, repetitive testing, and time testing.

## 4-2 General Measurement Setups

Please refer to User Guide for selecting the Channel Scanner mode, setting up frequency, span, amplitude, GPS, limit lines, markers, and file management.

## 4-3 Sample Procedure

The following procedure demonstrates a common channel scanner setup.

1. Press the **Scanner** main menu key to activate the Scanner menu. The power can be scanned using a signal standard and channel numbers or by entering a start frequency, frequency step size and bandwidth. The channels can be customized using the Scan Custom List or Custom Setup. For this example, select the channels by pressing the Scan Channels submenu key, then the Signal Standard submenu key. Select the CDMA US PCS signal standard.
2. Press the Number of Channels submenu key and enter 20.
3. Press the **Amplitude** main menu key and set the Reference Level and Scale so that the power of all the channels is displayed on the screen.
4. Press the **Measurements** main menu key to activate the Measurement menu.
5. Press the Display submenu key and select Graph display to display the measurements in the graph format.
6. Press the Channel Units submenu key and select Channel to display the measurements in channel format.
7. Press the Units Display submenu key and choose Max to display the maximum measured power for each channel.

<b>Note</b> Confirm Max Hold is either On or set to 5 sec before setting this parameter.
--

8. Press the Color Code submenu key and select Dual to display the measurements in dual colors.

<b>Note</b> Measurements can be made when the base station is in service, out of service, or over the air.
--

## 4-4 Custom Setup Measurements

### Procedure

1. Press the **Custom Scan** main menu key.
2. Press the **Number of Channels** submenu key to define how many channels to include in the custom list. This choice can be changed later if needed.
3. Press the **Edit List** submenu key to bring up the list of channels. The channel highlighted in blue is the channel active for editing. Use the **Up/Down** arrows to select the channel to edit. Each channel can be set up differently.
4. Press either the **Select Signal Standard** submenu key or the **Set Freq** submenu key. If the **Select Signal Standard** submenu key was pressed, select the desired air interface standard from the dialog box. When a standard is selected, the usual bandwidth for that standard is automatically set. The bandwidth can be changed if desired.
5. Press the **Set Channel** submenu key to enter the desired channel number. If the **Set Freq** submenu key was pressed, the frequency value of the active channel will be highlighted. Use the rotary knob or the numeric key pad to enter the desired center frequency in Hz, kHz, MHz, or GHz.
6. Press the **Set Bandwidth** submenu key and use the rotary knob or numeric keypad to enter the desired value in Hz, kHz, MHz, or GHz.
7. Press the **Done Editing** submenu key.
8. Repeat steps 3 through 7 to continue editing additional channels.

## 4-5 Custom Setup Example

This example explains how to monitor several signals, plus a potential intermodulation product, to see if there is a correlation between the nearby signals and an intermittent interference problem.

The signals on or near the rooftop are:

- An FM broadcast station at 106.5 MHz
- A paging transmitter at 157.86 MHz
- Three cellular sites:
  - US CDMA PCS channel 50 (1932.5 MHz)
  - AMP/EIA 553 channel 525 (885.750 MHz)
  - GSM 1800 channel 512 (1805.2 MHz)
- A Ham repeater at 147.36 MHz
- A Ham repeater at 446.5 MHz
- A land mobile repeater at 451.7875 MHz
- A public safety repeater at 485.5625 MHz
- In addition, the site is near the flight path of an airport. The approach frequency is 121.4 MHz.

Set up a measurement channel for each of the signals to be observed plus extra channels for any intermodulation products to be observed.

After the channels are set up, press **Shift | File | Save** then press the **Change Type** submenu key and select **Setup** from the list by using either the **Up/Down** arrow keys or the rotary knob, then press **Enter**. Name the setup for easy recall later and press **Enter**.

## 4-6 Script Master Measurement Setup

The Script Measurement function (**Scanner** | Scan Scriptmaster) allows the user to increase the number of channels to scan from 20 channels to 1,200 channels. Channel scanning is done in groups of 20. So if the maximum number of channels were set, then there would be 60 sets of 20 channels.

The Channel Scanner Script Master allows the user to automatically repeat scanning of all channels multiple times. You may choose to repeat the scan for a specified number of cycles, or choose a time duration until which the scan is repeated or ended. Please refer to Script Master Editor in Master Software Tools for creating and uploading Script Files to the instrument.

Press the **Repeat Scan Type** submenu key to set either the number of scans or period of time as the mode of testing. If **# Scans** is selected, use the **# of Repeat** submenu key to set the number of repetitions for testing the full list of channels in the Script Master Test file. The maximum number of repetitions is 1000. If **Time** is selected, use the **Scan Duration** submenu key to setup a test period for testing the channels in the Script Master Test File.

If testing the number of channels in the Script Master Test File is shorter than the Scan Duration, testing those channels will repeat. If testing the number of channels in the Script Master Test File is longer than the Scan Duration, scanning ends and the rest of the channels are not tested. Units for Scan Duration is days, hours, minutes, and seconds, with a maximum scan time of three days and a minimum scan time of ten minutes.

The sets of channels in the Script Master Test File can also be tested repeatedly. Use the **# of Repeats (Set)** submenu key to set this parameter. For example, if 5 were entered, then each set of 20 channels, would be tested five times before the next set of channels are tested.

The **# of Repeats (Set)** feature can be used in combination with **# of Repeats (List)** feature. For example, the Script Master Test File contains 100 channels, that is 5 sets of 20 channels. **# of Repeats (Set)** is set to 3 and **# of Repeats (List)** is set to 5. Pressing the **Start/Restart Test** button starts test on the first 20 channels for 3 iterations, then testing moves to the 2nd set of channels for 3 iterations and continues on till the 5th set is tested for 3 iterations. Then the list of 100 channels are tested again with each set of channels being tested 3 times. Testing is ended when five cycles of testing on 100 channels completed.

### Procedure

1. Press the **Scanner** main menu key.
2. Press the **Script Master** submenu key. If no script file is currently in use, the **Select Script Master Scan Setup File** dialog will open. Select from that dialog list the desired script file. If a script file is in use or has been loaded, pressing the **Script Master** submenu key will list the **Scan Script Master** submenu.
3. Press the **Select Test** submenu key to enter a new or change the current Script Master Scan Setup file. The **Select Script Master Scan Setup File** dialog opens. Select the desired measurement script file. Once a new file is selected, the channels are loaded, along with any other scan parameters defined in the file. To over ride these parameters, follow steps 4 through 6, otherwise continue to step 7.



4. Press the Repeat Scan Type to select the desired scan mode # Scans, go to step 4a, to select Time, go to step 4b.
  - a. If # Scans is selected, press # of Repeats (List) to set the desired repetition of test cycles of the Script Master Test File. Select the # of Repeats (List) define how many channels to include in the custom list. This choice can be changed later if needed.
  - b. If Time is selected, press Scan Duration to set the desired testing period. Time on the submenu key turns red for editing. Pressing a number on the numeric keypad lists the Time menu. Press the appropriate time unit.
5. If repeated set testing is desired, press the # of Repeats (Sets) submenu key and enter the desired number of test cycles.
6. Press the Record to the On position to store test measurements.
7. Press the Start/Restart Test submenu key to begin testing.

### 4-7 Channel Scanner (CHS) Menu Tree

Figure 4-1 show the map of the Channel Scanner menus. The following sections describe CHS main menu and associated submenus. The submenus are listed in the order they appear on the display from top to bottom under each main menu.

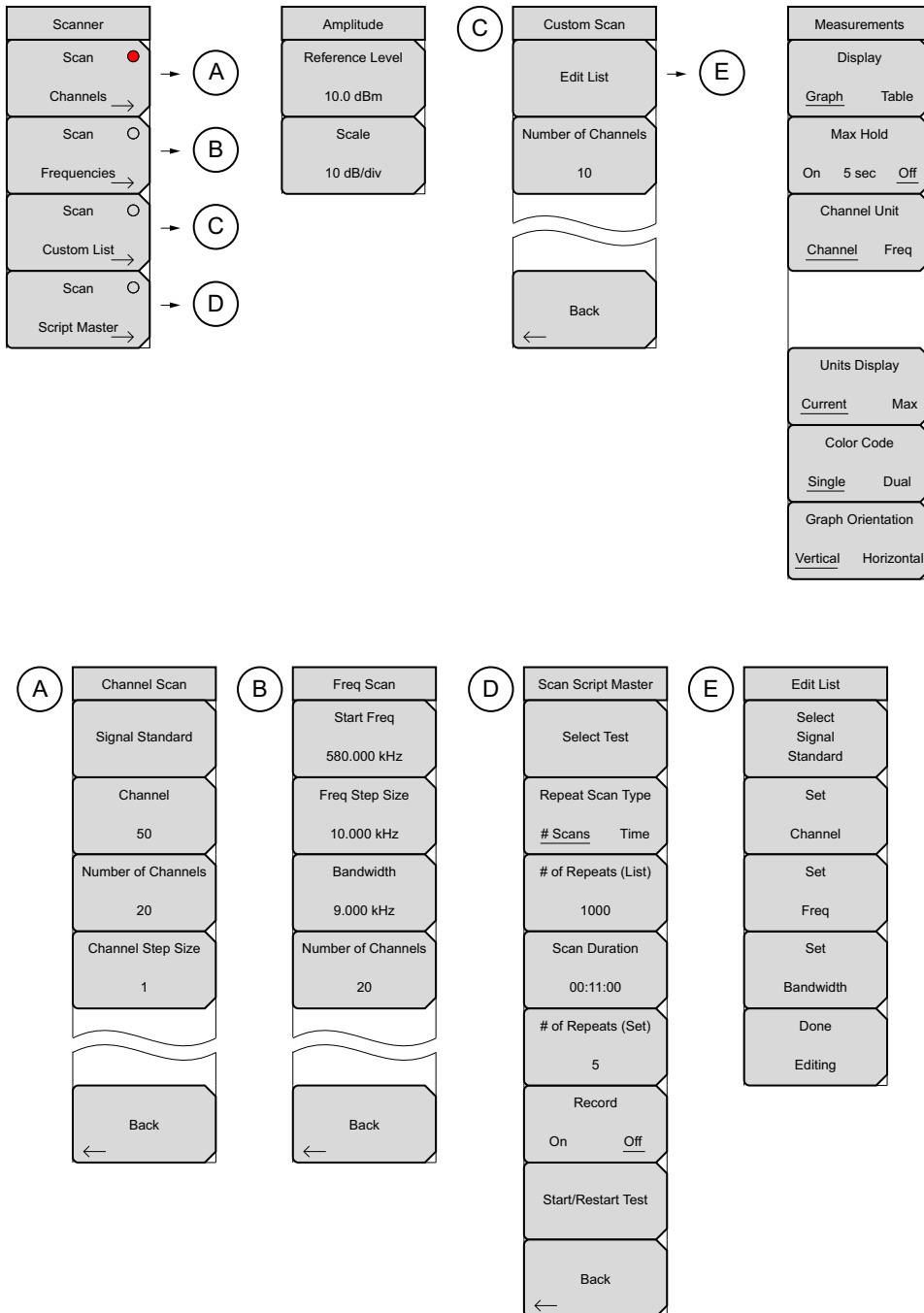
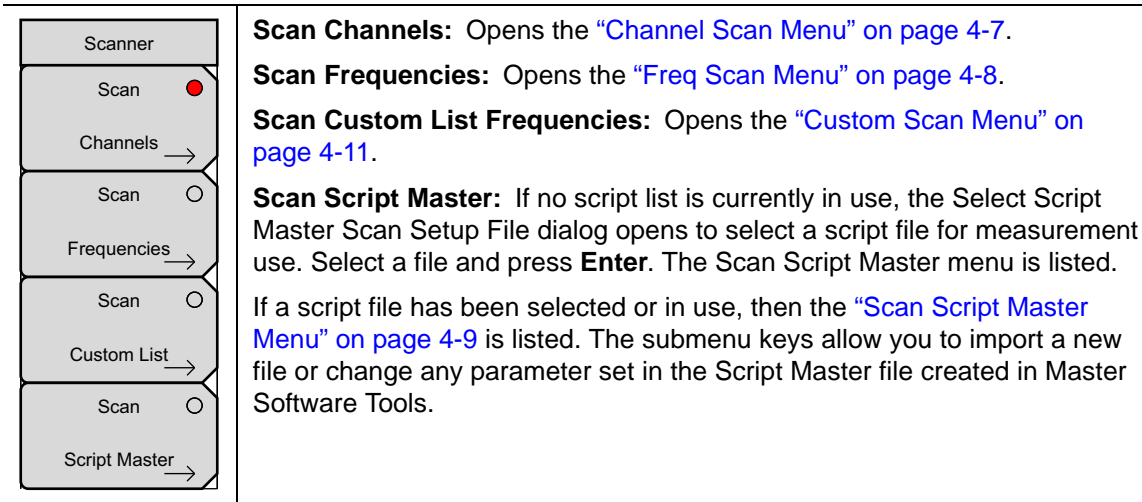


Figure 4-1. Main Menu Keys

## 4-8 Scanner Menu

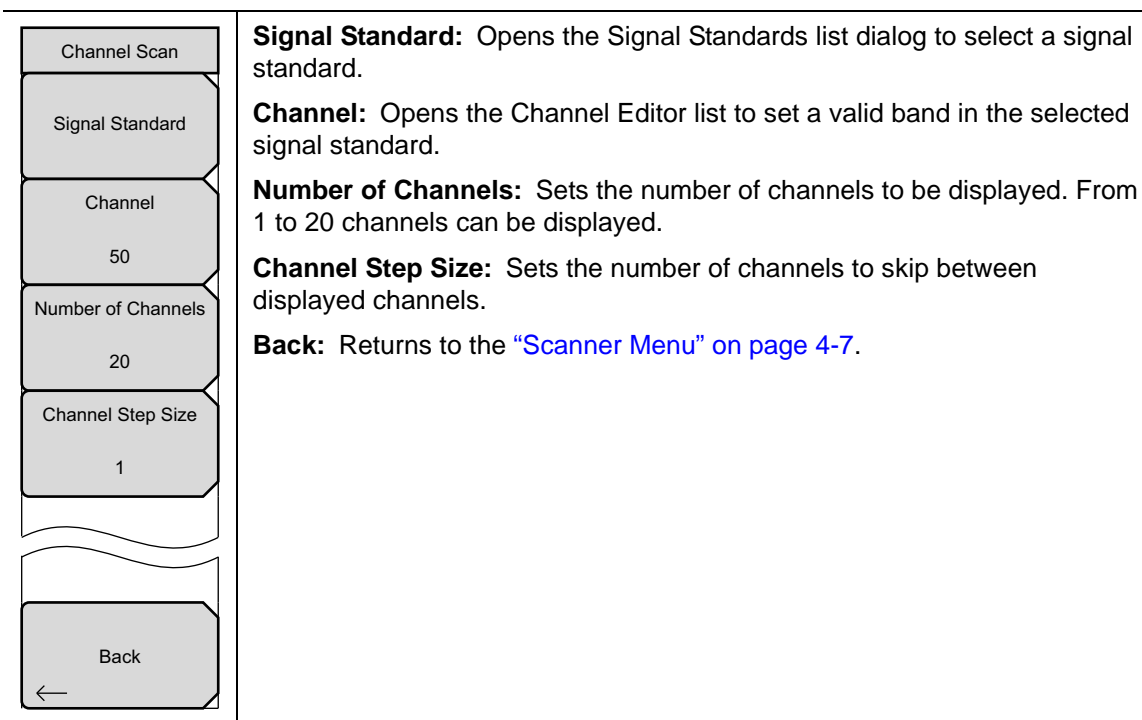
Key Sequence: **Scanner**



**Figure 4-2.** CHS Scanner Menu

### Channel Scan Menu

Key Sequence: **Scanner** > Scan Channels



**Figure 4-3.** CHS Channel Scan Menu

## Freq Scan Menu

Key Sequence: **Scanner** > Scan Frequencies

Freq Scan	<b>Start Freq:</b> Sets the center frequency of the first channel to be displayed.
Start Freq 580.000 kHz	<b>Freq Step Size:</b> Sets the spacing between frequencies on the display.
Freq Step Size 10.000 kHz	<b>Bandwidth:</b> The channel bandwidth can be manually entered in GHz, MHz, kHz, or Hz.
Bandwidth 9.000 kHz	<b>Number of Channels:</b> Sets the number of channels to be displayed (1 to 20).
Number of Channels 20	<b>Back:</b> Returns to the <a href="#">“Scanner Menu” on page 4-7</a> .
Back ←	

**Figure 4-4.** CHS Frequency Scan Menu

## Scan Script Master Menu

Key Sequence: **Scanner** > Scan Script Master

Scan Script Master	<b>Select Test:</b> Opens the Select Script Master Scan Setup File dialog to select a script file for measurement use.
Select Test	<b>Repeat Scan Type #Scans/Time:</b> Sets the scan to run through the number of scans set using # of Repeat (List) or for the period of time set using Scan Duration.
Repeat Scan Type	<b># of Repeats (List):</b> Sets the number of scan repetitions for the # of Repeats (Set).
# Scans      Time	<b>Scan Duration:</b> Sets the period of time channel scanning takes place for use with Repeat Scan Type.
# of Repeats (List)	<b># of Repeats (Set):</b> Sets the number of times each set of 20 channels are scanned.
1000	<b>Record On/Off:</b> Turns on the record mode. When the set # Scans are completed or the set Time has ended, the measurements will be stored to memory.
Scan Duration	<b>Start/Restart Test:</b> Starts or Restarts the test.
00:11:00	<b>Back:</b> Returns to the <a href="#">“Scanner Menu” on page 4-7</a> .
# of Repeats (Set)	
5	
Record	
On <u>Off</u>	
Start/Restart Test	
Back	
←	

**Figure 4-5.** CHS Scan Script Master Menu

## 4-9 Amplitude Menu

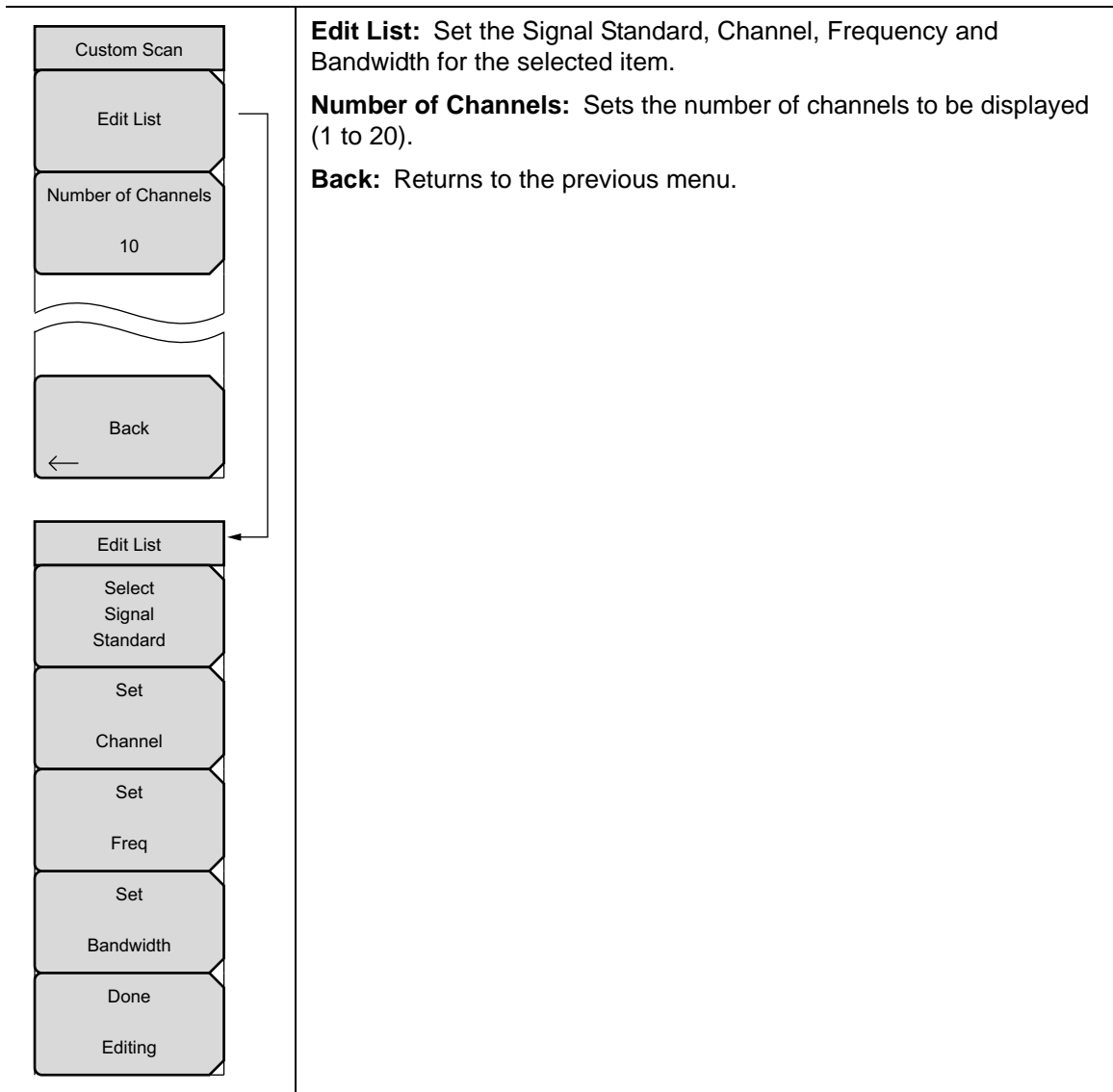
Key Sequence: **Amplitude**

Amplitude	<b>Reference Level:</b> Activates the amplitude reference level function which sets the amplitude at the top of the display. Valid reference levels are from +30 dB to -130 dBm.  <b>Scale :</b> Activates the scale function which sets the dB/division value from 1 dB/div to 15 dB/div in 1 dB steps.
Reference Level 10.0 dBm	
Scale 10 dB/div	

**Figure 4-6.** CHS Amplitude Menu

## 4-10 Custom Scan Menu

Key Sequence: **Custom Scan**



**Edit List:** Set the Signal Standard, Channel, Frequency and Bandwidth for the selected item.

**Number of Channels:** Sets the number of channels to be displayed (1 to 20).

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

**Figure 4-7.** CHS Custom Scan Menu

## 4-11 Measurements Menu

Key Sequence: **Measurements**

<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Measurements</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Display Graph    Table</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Max Hold On   5 sec   Off</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Channel Unit Channel    Freq</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Units Display Current    Max</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Color Code Single    Dual</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Graph Orientation Vertical    Horizontal</div>	<p><b>Display Graph/Table:</b> Toggles the display between table and graph formats, see <a href="#">Figure 4-9</a> and <a href="#">Figure 4-10</a> for examples of the two formats.</p> <p><b>Max Hold On/5 sec/Off:</b> Turns on or off small yellow lines for every channel/frequency on the display that indicate the highest level that channel or frequency has reached. The 5 sec option holds the small yellow line at the highest level in the last 5 seconds.</p> <p><b>Channel Units Channel/Freq:</b> Toggles the display channel units between channel number and frequency.</p> <p><b>Units Display Current/Max:</b> The current power units are displayed at the bottom of the channels, or the maximum power is displayed (activated only when Max Hold is set to On or 5 sec).</p> <p><b>Color Code Single/Dual:</b> Channels can be represented in one color or two alternating colors.</p> <p><b>Graph Orientation Vertical/Horizontal:</b> When Graph is selected in the Display submenu, this key toggles the graph orientation between vertical and horizontal.</p>
--	--

**Figure 4-8.** CHS Measurements Menu

**Note** Screen captured images are provided as examples. Measurement details shown on your instrument may differ from the examples in this user guide



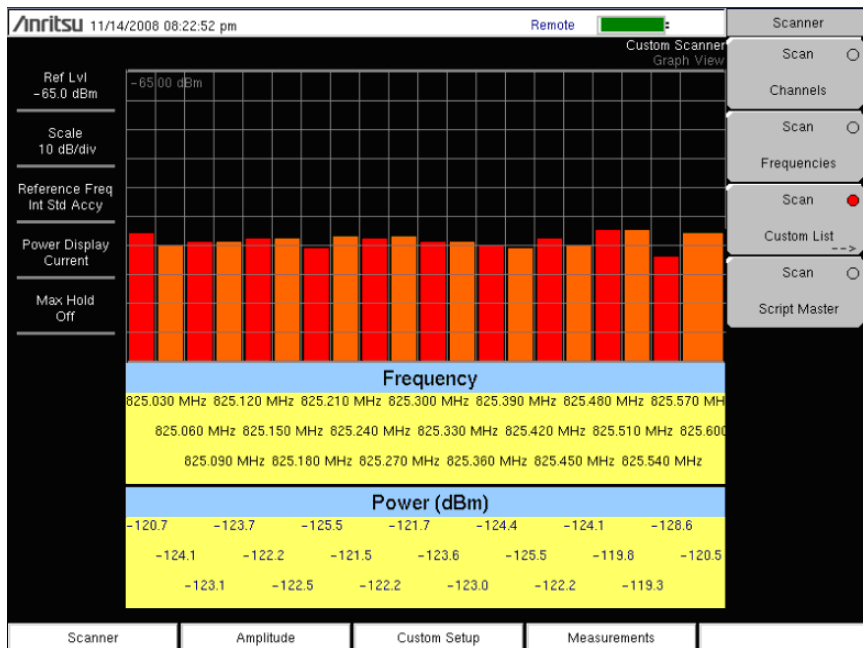


Figure 4-9. Channel Scanner Graph Display

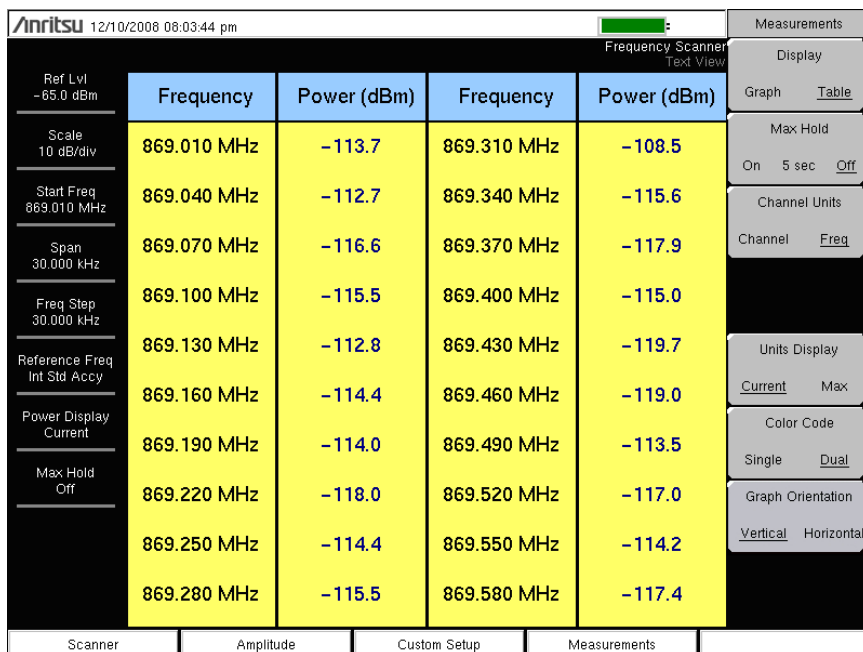


Figure 4-10. Channel Scanner Table Display

## 4-12 Sweep Menu

This menu is not available in Channel Scanner measurement mode.

## 4-13 Measure Menu

This menu is not available in Channel Scanner measurement mode.

## 4-14 Trace Menu

This menu is not available in Channel Scanner measurement mode.

## 4-15 Limit Menu

This menu is not available in Channel Scanner measurement mode.

## 4-16 Other Menus

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

# Chapter 5 — CW Signal Generator (Option 28)

<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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## 5-1 Introduction

This chapter presents information and procedures used to make measurements using the optional CW Signal Generator mode (Option 28).

The CW Signal Generator provides a continuous wave (CW) signal from the VNA RF Out port of the instrument. The CW signal is primarily used for testing the sensitivity of receivers. To test receiver sensitivity, connect the signal directly to the receiver that is being measured, and then reduce the output amplitude until the receiver drops the signal.

The external splitter feeds the signal into the RF input of the instrument. The display shows the output power and frequency. The amplitude is set by using an external step attenuator.

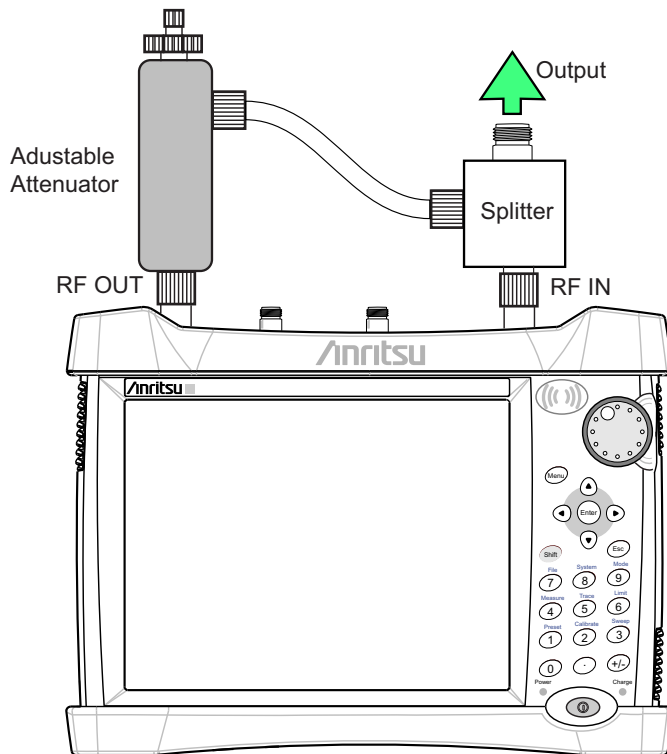
The external splitter and attenuator are purchased separately. They are available as CW Signal Generator kit, part number 69793. The “fixed” CW signal levels vary as a function of the frequency.

### Required Equipment

- CW Signal Generator Kit 69793

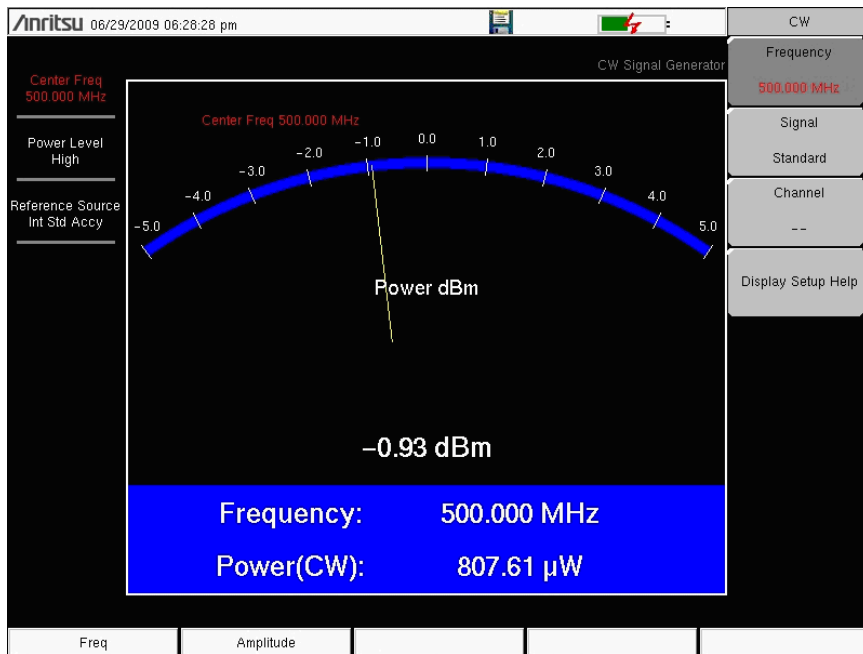
## 5-2 Procedure

1. On the instrument, press the **Menu** key and select the CW Signal Generator icon.
2. Connect the attenuator to the RF Out port and the splitter to the RF In port as show in [Figure 5-1](#).



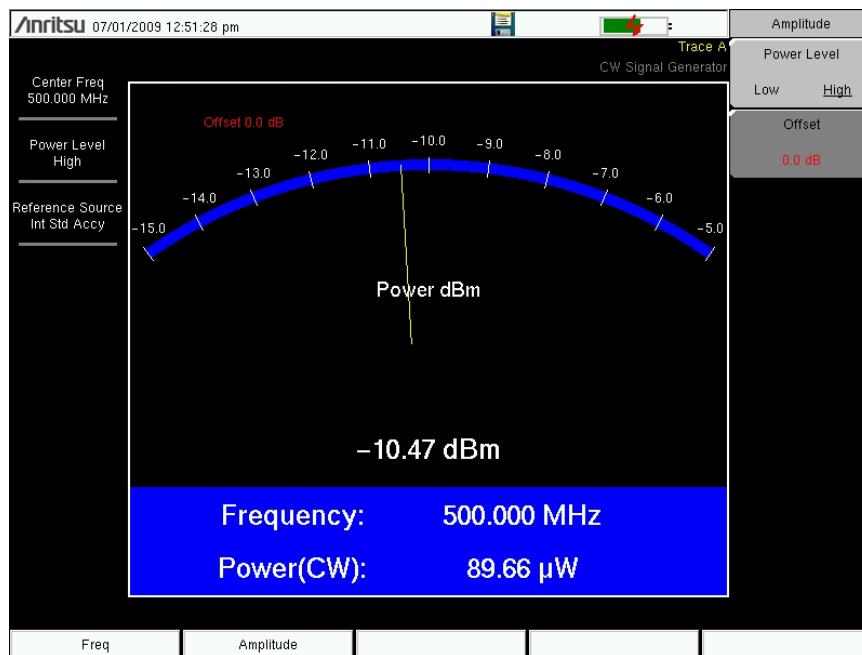
**Figure 5-1.** CW Signal Generator Configuration

3. Press the **Freq** menu key to set the desired frequency.



**Figure 5-2.** CW Signal Generator Frequency Menu

- Press the **Amplitude** key and set the power level to High or Low. The typical nominal output power in the high setting is about 0 dBm. The typical nominal output power in the low setting is about -30 dBm.



**Figure 5-3.** CW Signal Generator Frequency Menu

- Change the settings on the attenuator to adjust the power level. The large knob changes the power in 10 dB steps and the small knob adjusts the power level in 1 dB steps.
- Press the **Offset** submenu key to add an offset (in dB) to the amplitude level. This offset compensates for any attenuation that is placed in-line between the splitter and the DUT. Offset range is +100 dB to -100 dB.

# Chapter 6 — Coverage Mapping (Option 431)

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

## 6-1 Introduction

Coverage Mapping option allows users to map RSSI and ACPR measurements. The included Map Master program creates special maps compatible with the Anritsu Spectrum Master. The software imports maps from any map provider and creates files with or without GPS information. The files will have a .map extension. Anritsu Map Master is shipped with the instrument on a CD and is also available from the Anritsu web site ([www.anritsu.com](http://www.anritsu.com)).

The Coverage Mapping option is suitable for both Indoor and Outdoor mapping.

**Note** Set the instrument to Spectrum Analyzer mode for Coverage Mapping (Option 431 required) measurements described in this chapter.

## 6-2 General Measurement Setups

Please refer to your User Guide for selecting the Spectrum Analysis mode, setting up frequency, span, amplitude, GPS, limit lines, markers, and file management.

## 6-3 Spectrum Analysis Settings

Refer to [Chapter 2](#) for details and full menu overview of Spectrum Analysis measurements including bandwidth parameters, sweep settings, trigger types, attenuator options, and preamp settings.

This chapter presents brief examples and menu overview of Option 431, Coverage Mapping. Press **Shift + Measure** (4) key followed by the More submenu key. Press the Coverage Mapping submenu key.

## 6-4 Coverage Mapping

**Note** Outdoor coverage mapping requires Option 31, GPS. Indoor coverage mapping does not.

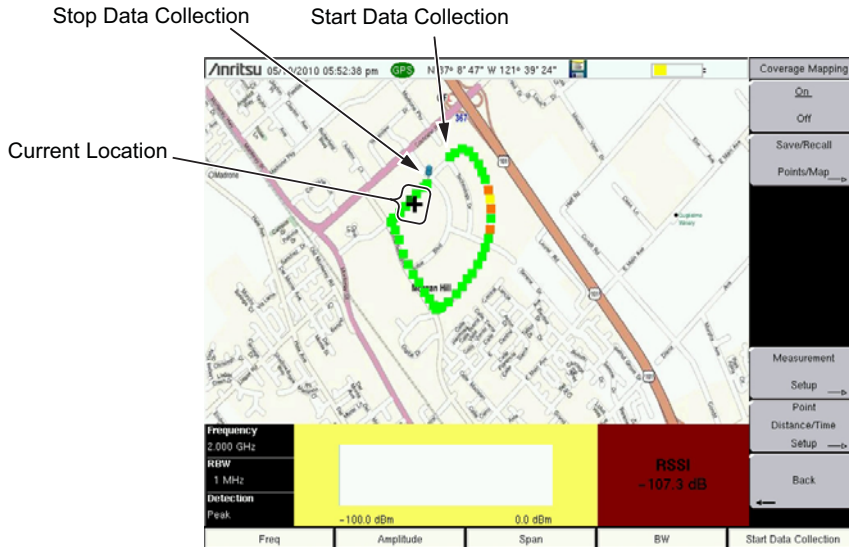
The Coverage Mapping option of instruments allows for both indoor (no GPS signal) and outdoor (GPS signal required).

- **Indoor Mapping:** Using a start-walk-stop approach, the instrument provides in-building coverage mapping by overlaying data directly onto the downloaded map. Data is captured at user-defined time intervals or user-defined map locations.

- **Output Mapping:** The instrument logs data automatically based on either time or distance interval. If there is no map available when making the measurements, it is still possible to save all the data to a KML file and then later combine the data file with a map.

**Outdoor Coverage**

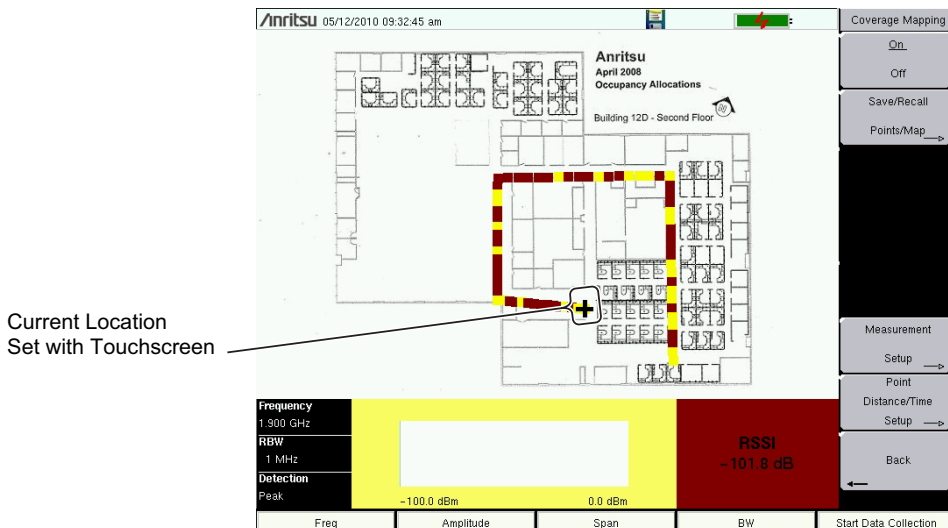
With a valid GPS signal, the instrument will identify the current location on the displayed GeoEmbedded map with a cross. Previously saved locations are displayed as squares.



**Figure 6-1.** Outdoor Coverage Mapping (GPS On)

**Indoor Coverage**

With GPS turned off, and a non-GeoEmbedded map file the user indicates the current position (+) with the touchscreen. Previously saved locations are displayed as squares.



**Figure 6-2.** Indoor Coverage Mapping (GPS Off)



Coverage Mapping is a four step process:

- Create an indoor or outdoor map using “Anritsu Map Master”.
- Load the map and configure the “Instrument Settings” on page 6-8.
- Install an antenna on the instrument and “Map the Signal Strength” on page 6-10.
- “Save the Coverage Mapping Information” on page 6-11.

## Anritsu Map Master

Anritsu Map Master allows you to capture maps of any location and create Anritsu Map Files. These Anritsu Map Files are used for Coverage Mapping and Interference Mapping (Chapter 3).

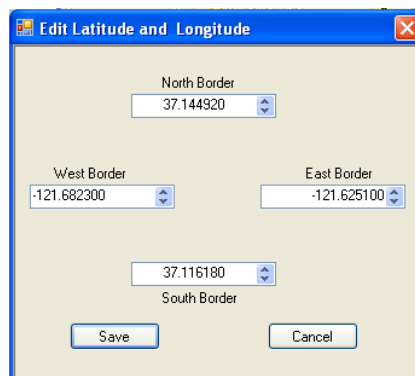
Install the software from the CD that came with the instrument or download and install Anritsu Map Master from the Anritsu web site ([www.anritsu.com](http://www.anritsu.com)).

### Create an Outdoor Map File with Map Master

Map Master is an program that allows you to create a map from any map provider such as Google Earth, Map Point, Yahoo Maps, openstreetmap, and others. There are two methods to create outdoor maps using Map Master:

**Method 1:** Open a JPEG, GIF, TIFF, or PNG file and adding GPS data.

1. Capture a bitmapped image of a map from a map provider and save in one of the file formats mentioned above.  
The image size should be close to 666 pixels x 420 pixels (~1.6:1 ratio).
2. Launch the Anritsu Map Master application.
3. In the File pull-down menu, select Open and choose the image file to convert to a map.
4. A dialog box will confirm that the file has been converted to a Anritsu Map Master (.map) file with the same file name.
5. Answer Yes at the Geo Map? dialog box.
6. From the Edit GPS Info pull-down menu select Set Latitude and Longitude (Figure 6-3).
7. Enter the longitude information in decimal degrees for the West and East Border
8. Enter the latitude information in decimal degrees for the North and South Border.



**Figure 6-3.** Adding GPS data to the Map.

9. If you only have GPS information in the Degree-Minute-Second (DMS) format, use the following relationship to convert to Decimal Degrees (DD):

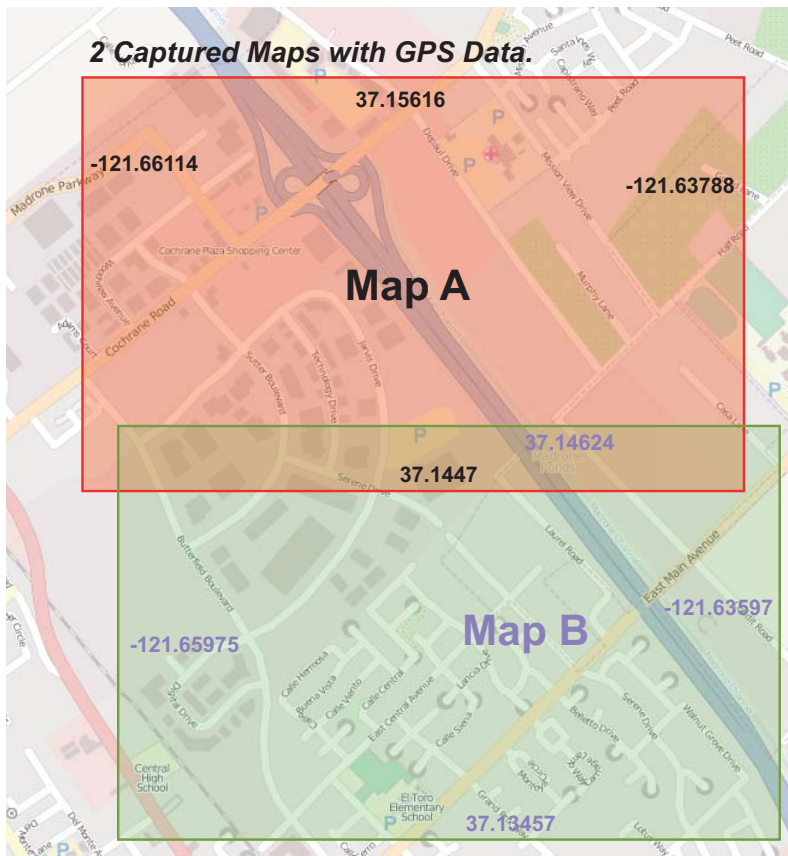
$$\text{Degrees} + \frac{\text{Minutes}}{60} + \frac{\text{Seconds}}{3600} = \text{DD}$$

**Note** Remember to enter location information for the borders of the map, not your current location.

10. In the File pull-down menu, select Save or Save As to save the file to a USB flash drive. The file will be needed in the next section, “Instrument Settings” on page 6-8.

**Note** A USB flash drive is required to transfer maps to the instrument.

Figure 6-4 is an example of two overlapping maps from a mapping service with GPS data for the border of each map.

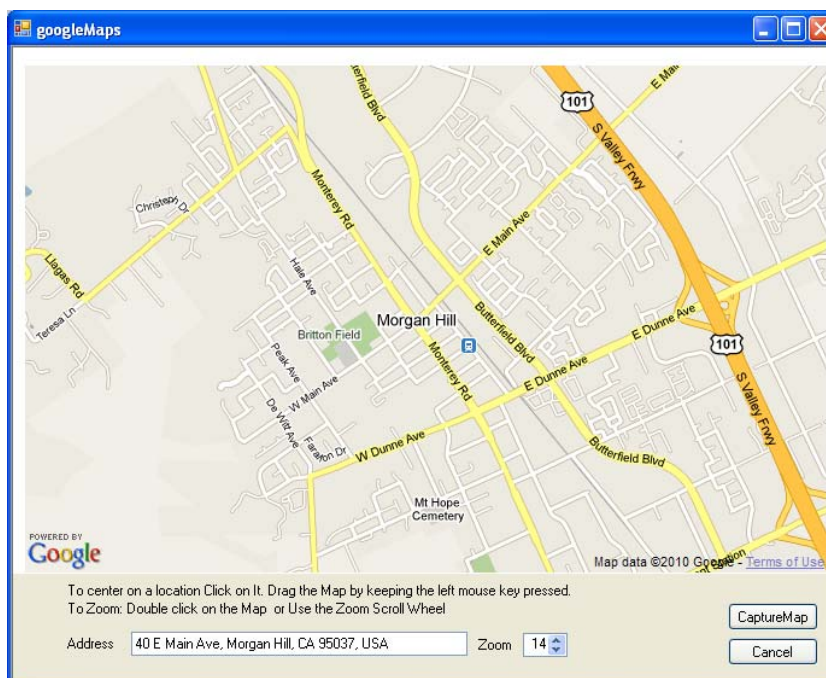


**Figure 6-4.** Overlapping Captured Maps with Border GPS Data

**Note** Map Master can open and modify GPS data in existing .map files.

**Method 2:** Typing in an address in Map Master and capturing the maps with GPS data.

1. Launch the Anritsu Map Master application.
2. Click on the Capture Map pull-down menu then select Google Maps.
3. Enter a street address in the address field.
4. Zoom in or zoom out with the arrow keys, typing in the Zoom box or double-clicking the left or right mouse button (Figure 6-5).



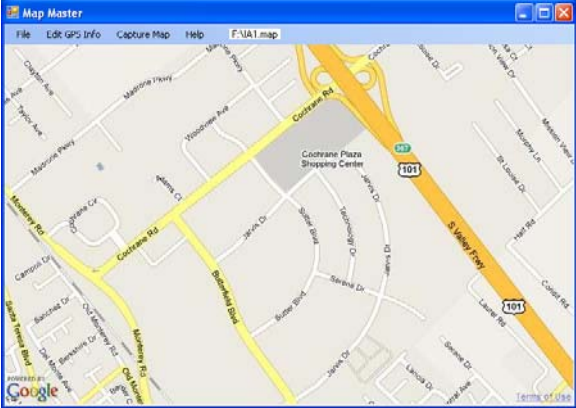
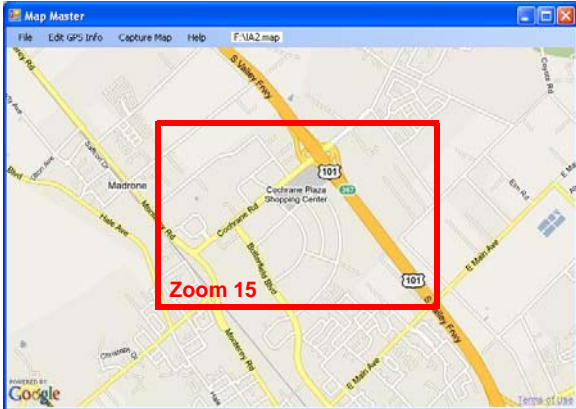

**Figure 6-5.** Capturing a Map Using a Street Address

5. Click on the Capture Map button. in the bottom-right corner.
6. In the File pull-down menu, select Save or Save As to save the file to a USB flash drive. The file will be needed in the next section, “Instrument Settings” on page 6-8.

**Note** A USB flash drive is required to transfer maps to the instrument.

7. Select Yes in the Geo Map dialog box to save the file with GPS information.
8. Repeat step 2 through step 7 for any additional maps or zoom levels.
9. The GPS information can be viewed or edited from the Edit GPS Info pull-down menu (Figure 6-3).
10. Creating and saving .map files of the same address at several zoom levels will be helpful in the field when your location is off the current view or the vectors cross outside of the current map displayed on the instrument. Table 6-1 lists the map area at several zoom levels. Notice from the examples that zooming in a level with Anritsu Map Master reduces the map dimensions by half while zooming out a level doubles the map dimensions.

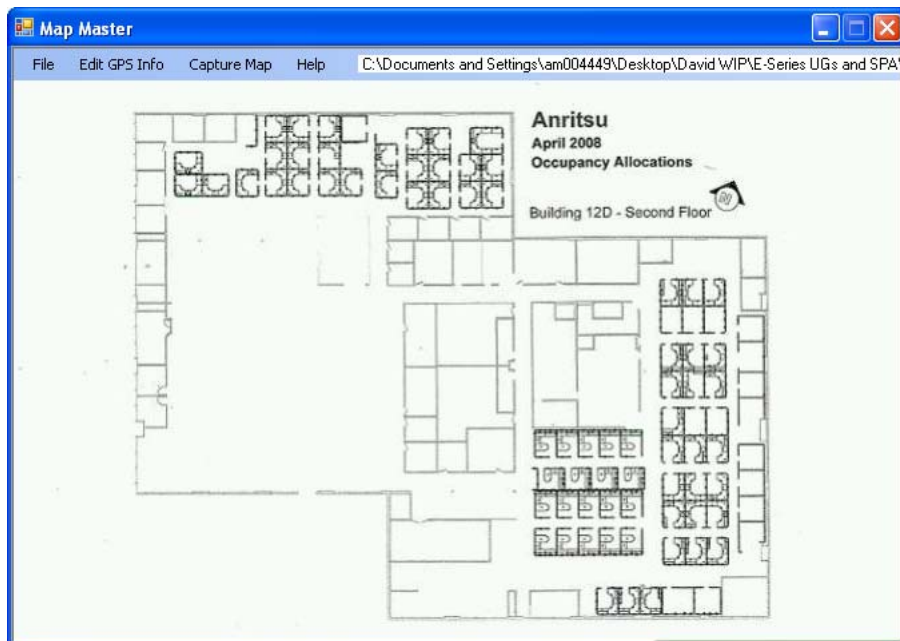
**Table 6-1.** Map Coverage at Different Zoom Levels

Zoom Level	Map Dimensions	Sample Map
15	1 mile x 1.5 miles (1.5 square miles)	
14	2 miles x 3 miles (6 square miles)	
13	4 miles x 6 miles (24 square miles)	

**Create an Indoor Map File with Map Master**

1. Capture a bitmapped image of the floor plan for indoor mapping. Save the image in one of the compatible file formats (JPEG, GIF, TIFF, or PNG). The image size should be close to 666 pixels x 420 pixels (~1.6:1 ratio).
2. Launch the Anritsu Map Master application.
3. In the File pull-down menu, select Open and select the indoor mapping image file.
4. A dialog box will confirm that the file has been converted to a .map file with the same file name.
5. At the Geo Map? dialog box, answer No to create the indoor map.
6. In the File pull-down menu, select Save or Save As to save the file to a USB flash drive. The file will be needed in the next section, [“Instrument Settings” on page 6-8](#).

**Note** A USB flash drive is required to transfer maps to the instrument.



**Figure 6-6.** Indoor Floor Plan Map Created with Map Master

## Instrument Settings

### Setup

1. Create the appropriate map with Anritsu Map Master. Refer to “[Anritsu Map Master](#)” on page 6-3. Outdoor mapping requires a GeoEmbedded map or the default grid.
2. Open up Coverage Mapping by pressing the **Menu** key and selecting the Spectrum Analyzer icon or press **Shift** then **Mode** (9), highlight Spectrum Analyzer and press **Enter**.
3. Press **Shift** then **Measure** (4). Press the More submenu key then press the Coverage Mapping submenu key. Confirm that coverage mapping is On.

*Continue step 4 for outdoor coverage mapping only. GPS must be off for indoor mapping.*

4. Turn on GPS.
  - a. Press **Shift** then **System** (8).
  - b. Press the GPS submenu key.
  - c. Connect a GPS antenna to the SMA connector.
  - d. Turn on GPS. On should be underlined in the GPS submenu key.
  - e. Press GPS info and verify that the information from three or more satellites is captured. Press **Esc** to close the info box.

It may take several minutes for the GPS receiver to track at least three satellites. When it does the GPS icon at the top of the screen will turn green. Refer to the User Guide for your instrument for additional information about GPS.

### Recall a Map (Indoor or Outdoor Coverage)

The instrument allows you to recall a .map file (created with Anritsu Map Master). With a valid GPS signal the current location will be displayed on an outdoor map or an arrow will show the direction of the current location if it is outside the map coverage area. With an indoor map the user positions the cross at the current location using the touchscreen, or by using the arrow keys and then **Enter**.

Connect the USB flash drive that has the map file or files created in “[Anritsu Map Master](#)” on page 6-3 to the instrument.

1. Select the Coverage Mapping submenu key.
2. Press the Save/Recall Points/Map submenu key.
3. Press Recall a Map and select the appropriate map from the USB flash drive.
4. Use the arrow keys to scroll down to the desired map and press **Enter** to select.

*Step 5 and 6 apply for outdoor coverage mapping only.*

5. The new map file will be displayed and the current location (if within the GPS boundaries of the displayed map) is shown as a cross with outdoor mapping.
6. If the current location is outside the map boundaries, an arrow will indicate the direction of the current location in relation to the displayed map.

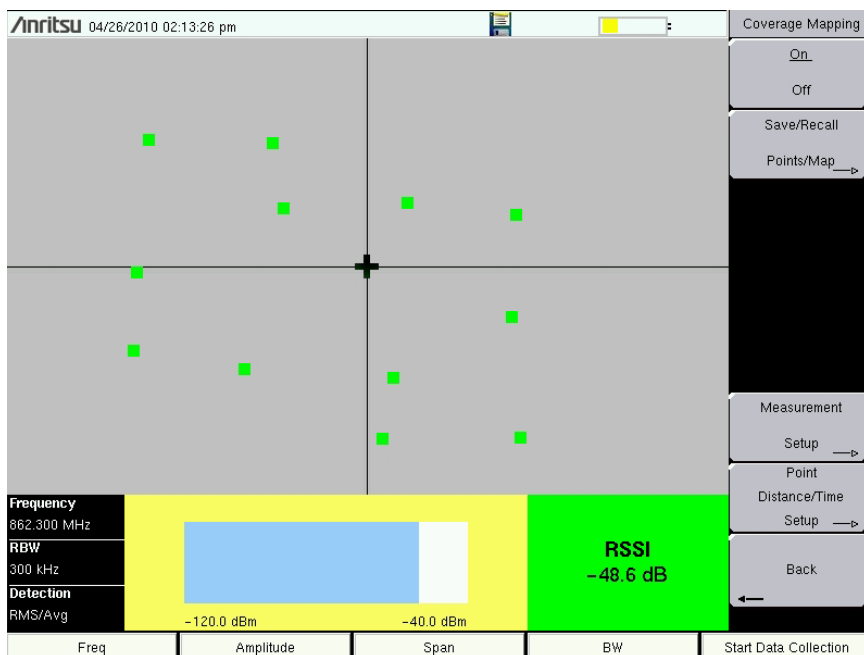
- Note** If you do not see the USB drive in the Recall menu:
1. Press the Refresh Directories key.
  2. If the drive is still not visible, remove and then reconnect the USB flash drive.
  3. Reformat the USB flash drive and copy the map files to the reformatted drive.

### Recall the Default Grid

The instrument is able to make coverage mapping measurements even when an Anritsu Map Master file of the current indoor or outdoor location is not available. In such cases, use the default grid map, save the KML points, and recall them at a later time with a map. Refer to [“Mapping Save/Recall Menu” on page 6-20](#) for additional information on recalling saved maps and .kml data.

- Note** When using the default grid the coverage area for outdoor cover mapping is fixed at 10 x 10 miles. For indoor coverage mapping, the grid size would be the indoor map files dimensions (666 pixels by 420 pixels).

1. Select the Coverage Mapping submenu key.
2. Press the Save/Recall Points/Map submenu key.
3. Press the Recall Default Grid submenu key.



**Figure 6-7.** Coverage Mapping with the Default Grid. Same .kml data as [Figure 6-2](#)

## Map the Signal Strength

Coverage Mapping supports RSSI measurement or ACPR measurement during mapping.

### ACPR

1. Select the Coverage Mapping submenu key.
2. Press the Measurement Setup submenu key.
3. Press ACPR once to select and again to open the setup menu.
  - a. Enter the Main and Adjacent Channel Bandwidths.
  - b. Enter the Channel Spacing.
  - c. Enter Good Passing Criteria and the Poor threshold level.
  - d. The main channel power indicator in the bottom part and the data collection squares will display colors as shown below:

Red Value (Poor) < Yellow Value < Green Value (Good)

4. Press the Start Data Collection main menu key. Data will be collected at the time or distance interval based on the setting in [“Point Distance/Time Setup Menu” on page 6-22](#). The color of the squares indicate the power level based on the ACPR setup.
5. Press the Stop Data Collection main menu key. Save the collected data as a .kml file, a tab-delimited text file (.mtd) or a .jpg file. Refer to [“Mapping Save/Recall Menu” on page 6-20](#).

<b>Note</b> The collected data can be saved in multiple formats.
--

### RSSI

1. Select the Coverage Mapping submenu key.
2. Press the Measurement Setup submenu key.
3. Press RSSI once to select and again to open the setup menu.
4. Set the threshold levels: Excellent, Very Good, Good, and Poor.
5. Press the Start Data Collection main menu key. Data will be collected at the time or distance interval based on the setting in [“Point Distance/Time Setup Menu” on page 6-22](#). The color of the squares indicates the power level based on the RSSI setup.
6. Press the Stop Data Collection main menu key. Save the collected data as a .kml file, a tab-delimited text file (.mtd) or a .jpg file. Refer to [“Mapping Save/Recall Menu” on page 6-20](#).



There are two options for interior coverage mapping considering the instrument does not have location or distance information available without GPS.

**Note**

*Option 1:* Sets the Repeat Type to Time and walk the perimeter of the coverage area. Press the touchscreen at each turn and the unit will interpolate collected data points based on the Repeat Time setting.

*Option 2:* Set the Repeat Type to Distance and walk the coverage area. Press the touchscreen at any time that signal power data points in required.

The saved .kml file in either option will not have GPS data, but it will plot on a 666 x 420 grid with RSSI or ACPR data for each captured point.

## Save the Coverage Mapping Information

There are three save options in Coverage Mapping: “[Save KML Points](#)”, “[Save Tab Delimited Points](#)” on page 6-12 or “[Save JPG](#)” on page 6-13.

### Save KML Points

Press Save/Recall Points/Map then Save KML Points. At the Save menu, press **Enter**. The following information is saved for the points and vectors currently displayed on the screen:

- Signal strength
- Setup (frequency, RBW, VBW, and detection type)
- Current location

The .kml file can be opened and viewed with Google Earth ([Figure 6-8 on page 6-12](#)) and can also be recalled and viewed on the instrument. Refer to “[Mapping Save/Recall Menu](#)” on [page 6-20](#) for additional information.

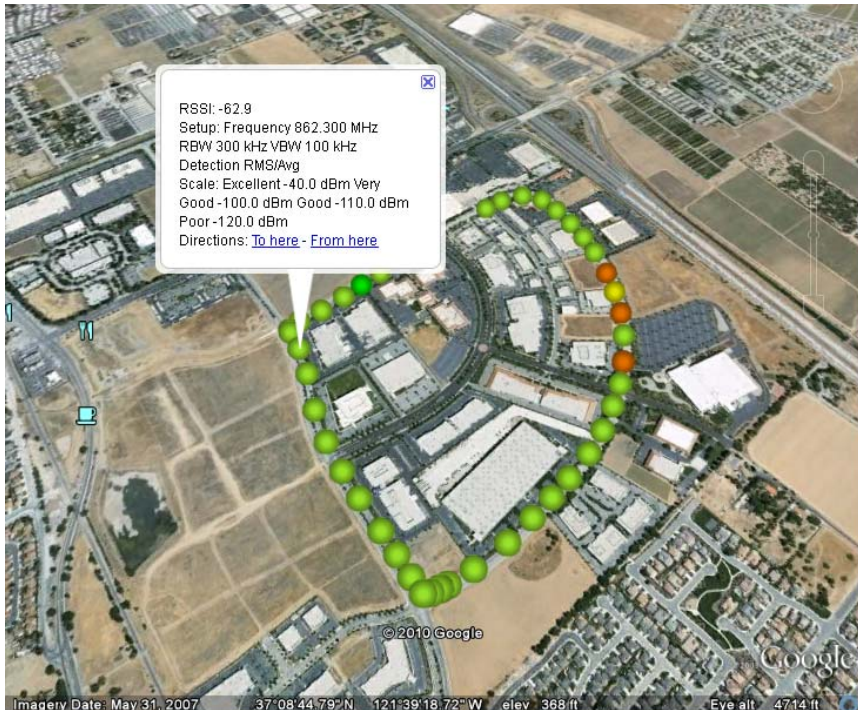
### Installing Google Earth

**Note**

1. Go to the web site: <http://earth.google.com/>.
2. Click Download Google Earth and follow the on-screen instructions.
3. After download, install Google Earth on your computer.
4. Double-click on the saved .kml file to view the measurements Google Earth.

After Google Earth is opened, user instructions and several types of help are available from the Help pull-down menu.

Saved .kml files can not be viewed directly from the instrument using Google Earth, the files need to be first copied to a USB memory stick.



**Figure 6-8.** Coverage Mapping KML File in Google Earth

**Note**

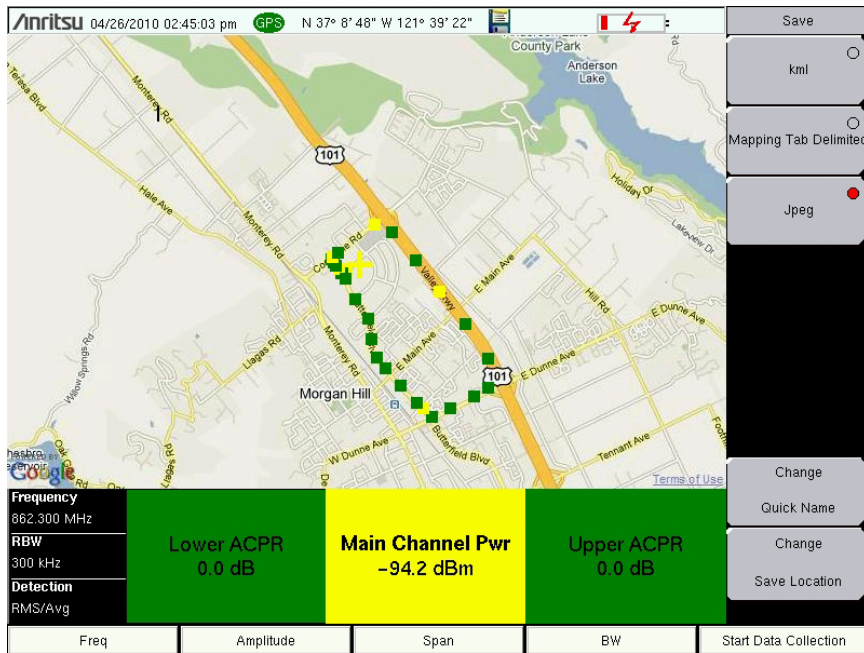
All files will be stored in the default save location. To change the default location, Press **Shift** then **File** (7) to enter File menu. Press Change Save Location. Create a new folder or change the current location on the USB flash drive or in the instrument's storage memory. Press Set Location to make this the new default location for saving files.

**Save Tab Delimited Points**

Press Save/Recall Points/Map then Save Tab Delimited Points. At the Save menu, press **Enter**. A tab delimited text file (.mtd) will be saved to the current location for the coverage mapping data currently displayed on the screen.

**Save JPG**

Press Save/Recall Points/Map then Save Jpg. At the Save menu, press **Enter**. A .jpg file of the current screen will be saved.



**Figure 6-9.** Time Interval Coverage Mapping Saved as a .jpg File

## 6-5 Coverage Mapping Menus

Figure 6-10 through Figure 6-15 show the map of the Spectrum Analyzer menus. Refer to Chapter 2, “Spectrum Analyzer” for the details of the menus and associated submenus.

Section 6-6 describes the details of Coverage Mapping (Option 431) menus and associated submenus.

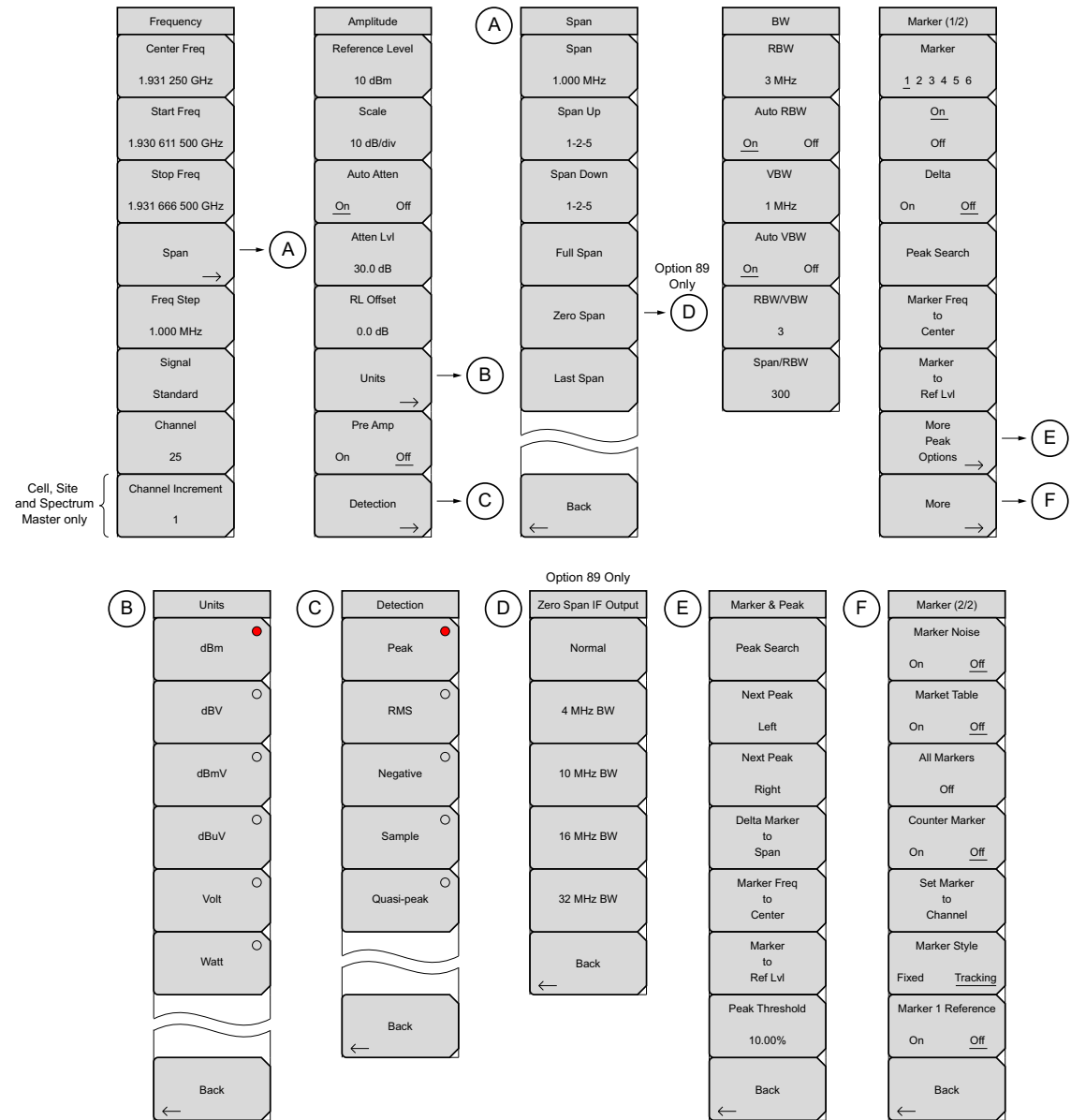


Figure 6-10. Main Menu Keys

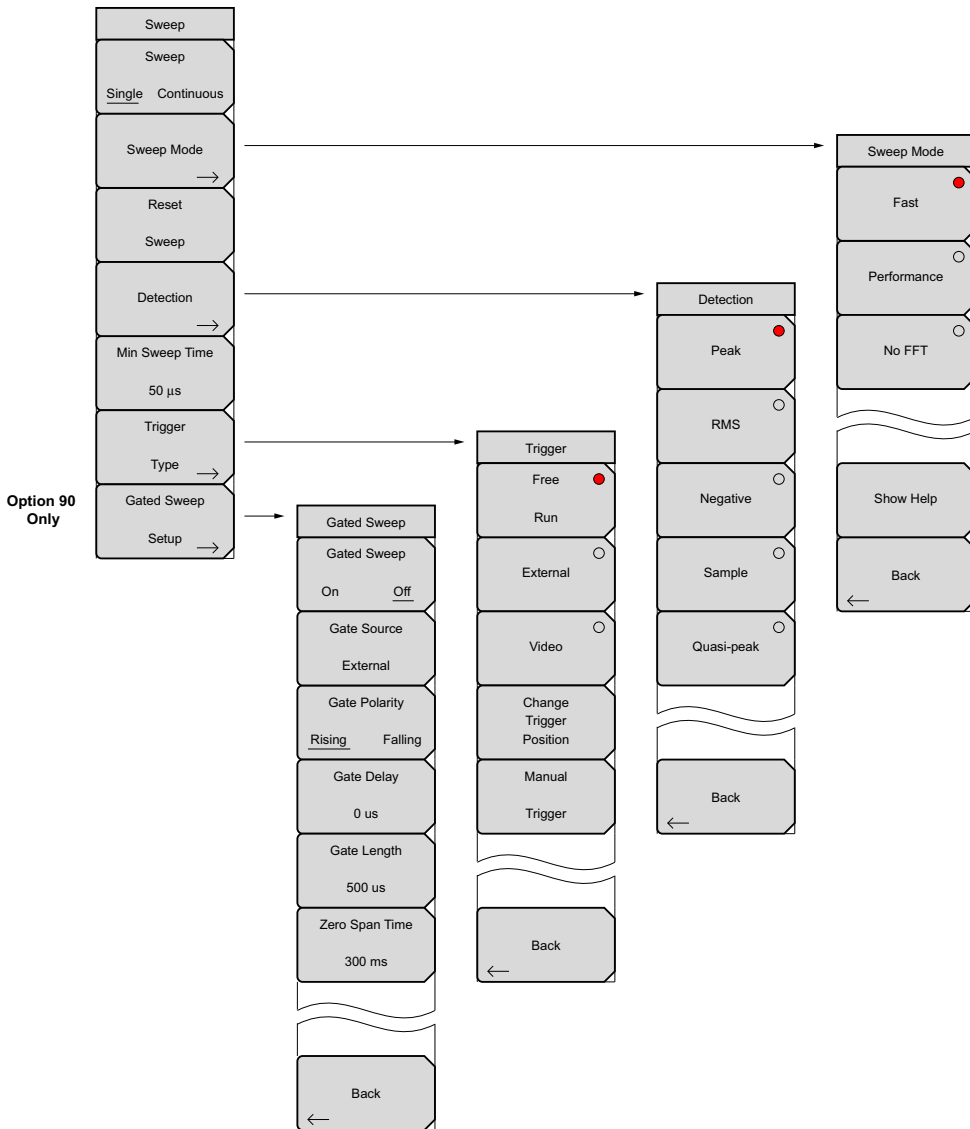


Figure 6-11. Sweep Submenu Keys

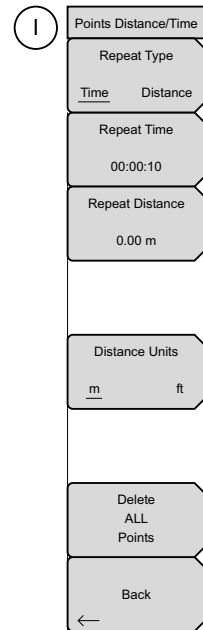
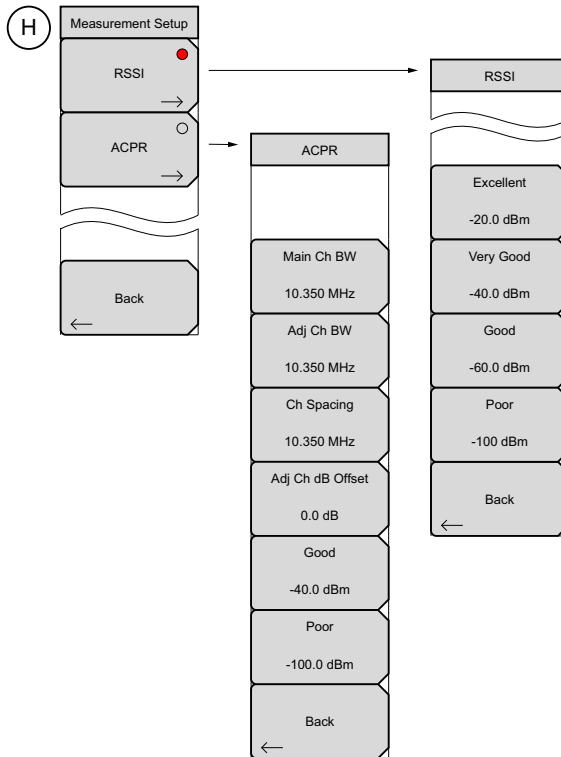
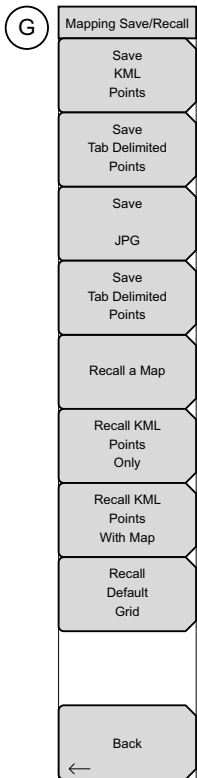
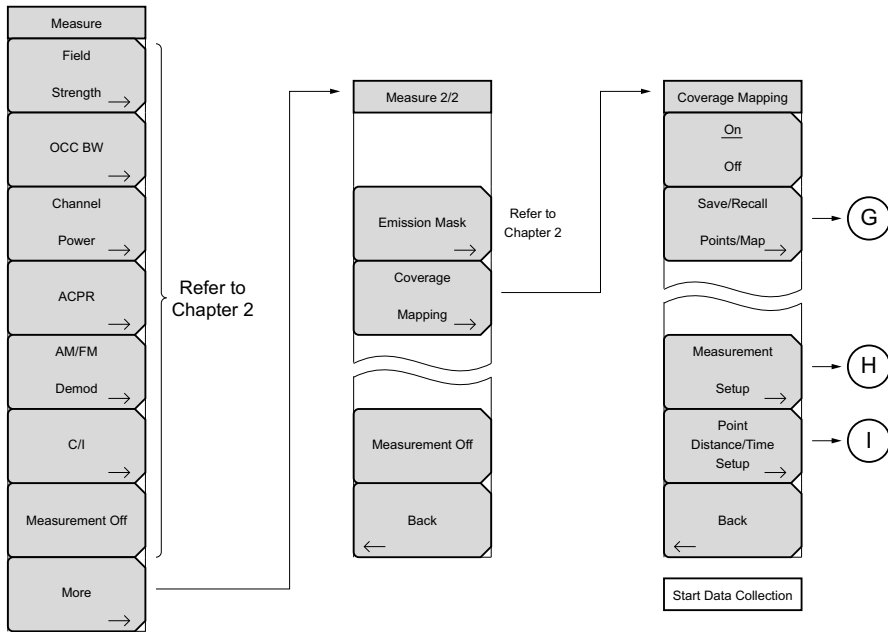


Figure 6-12. Measure Submenu Keys

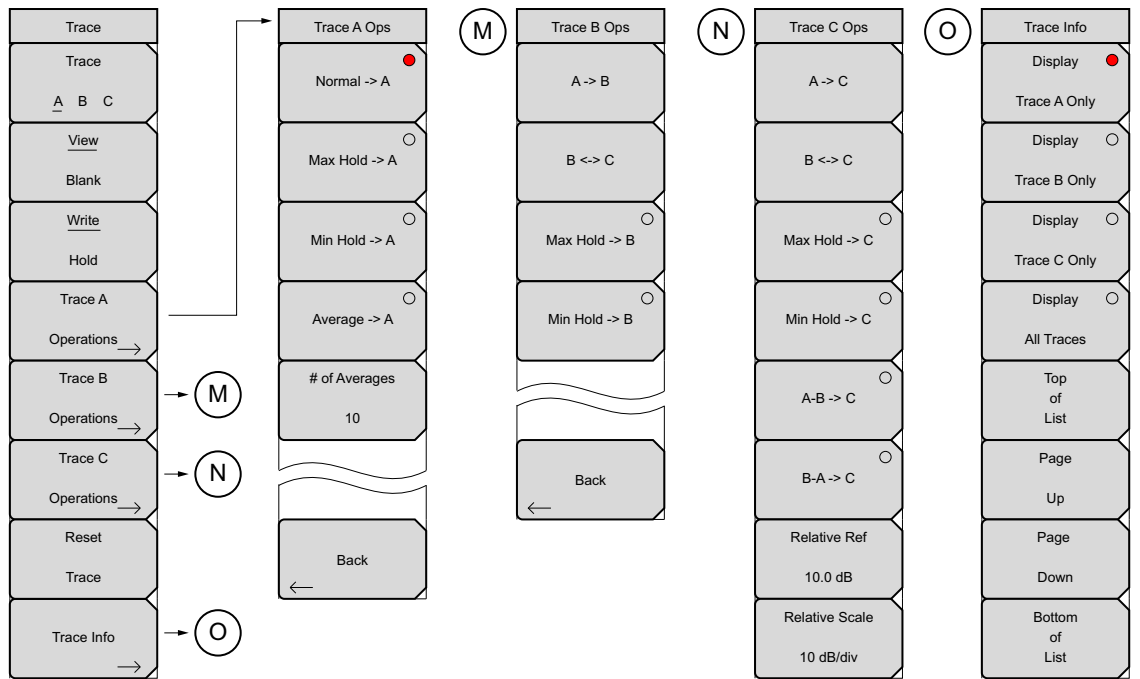


Figure 6-13. Trace Submenu Keys

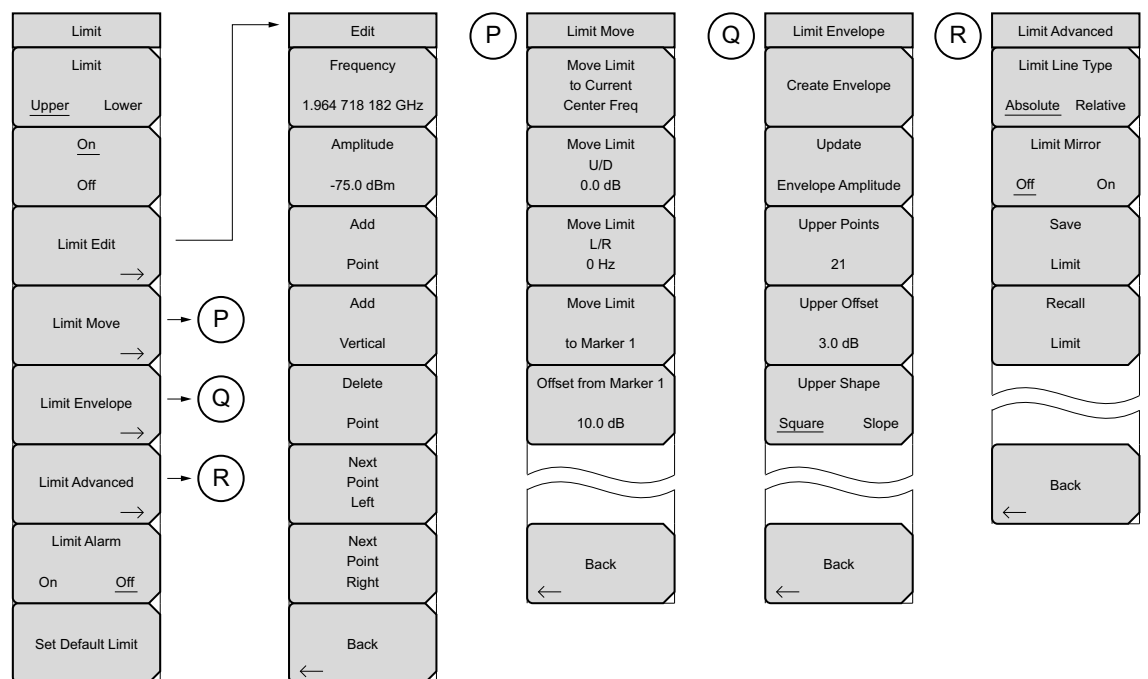


Figure 6-14. Limit Submenu Keys

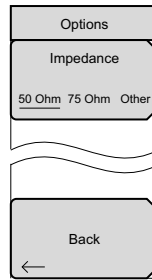


Figure 6-15. System Menu, Application Options Submenu Keys



## 6-6 Coverage Mapping Menu

Key Sequence: **Shift** > **Measure** (4) key > More > Coverage Mapping

<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Coverage Mapping</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">On</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Off</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Save/Recall</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Points/Map →</div> <hr style="border: none; border-top: 1px wavy black; margin: 10px 0;"/> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Measurement</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Setup →</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Point Distance/Time Setup →</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Back</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">←</div> <div style="border: 1px solid black; padding: 2px; margin-top: 10px; text-align: center;">Start Data Collection</div>	<p><b>On Off:</b> Toggles Coverage Mapping On or Off. The current Map or the Default Grid is displayed with Coverage Mapping is On. When Off, the instrument shows the standard spectrum display.</p> <p><b>Save/Recall Map Points:</b> Opens the <a href="#">“Mapping Save/Recall Menu”</a> on page 6-20.</p> <p><b>Measurement Setups:</b> Opens the <a href="#">“Measurement Setup Menu”</a> on page 6-21.</p> <p><b>Point Distance/Time Setup:</b> Opens the <a href="#">“Point Distance/Time Setup Menu”</a> on page 6-22.</p> <p><b>Back:</b> Returns to the <a href="#">“Measure 2/2 Menu”</a> on page 2-49.</p> <p><b>Start/Stop Data Collection:</b> Press this main menu key to start coverage mapping data collection based on Measurement Setup settings and Point Distance/Time Setup settings. A running count of collected data points is displayed at the bottom of the screen. Press again to stop data collection.</p>
---	--

**Figure 6-16.** Coverage Mapping Menu

## Mapping Save/Recall Menu

Key Sequence: **Shift** > **Measure** (4) key > More > Coverage Mapping > Save/Recall Points/Maps

Mapping Save/Recall	
Save KML Points	<b>Save KML Points:</b> Press this button to save the KML points. FileName.kml will be stored in the selected location. From the File menu, press Save then Change Save Location to change default location.
Save Tab Delimited Points	<b>Save Tab Delimited Points:</b> Press this button to save the points in a tab delimited text file. FileName.mtd will be stored in the selected location.
Save JPG	<b>Save JPG:</b> Press the Save JPG key to save a .jpg file of the current screen.
Recall a Map	<b>Recall a Map:</b> Opens the Recall menu for selecting a map created with the Anritsu Map Master program to display on the screen.
Recall KML Points Only	<b>Recall KML Point:</b> Opens the Recall menu for selecting a .kml file. Displays the saved locations overlaid on the default grid.
Recall KML Points With Map	<b>Recall KML Points With Map:</b> Opens the Recall menu for selecting a .kml file. If you already have a geo referenced map or a default grid map, press this key to recall previously stored KML points. This feature is useful if you made measurements earlier without the appropriate maps and would like to now view the saved point locations overlaid on top of a map.
Recall Default Grid	<b>Recall Default Grid:</b> If you do not have a GPS embedded map but are out in the field making measurements and would like to save the KML points, the Recall Default Grid submenu allows you to save points and the corresponding GPS coordinates to view at a later time.
Back	<b>Back:</b> Returns to the <a href="#">“Coverage Mapping Menu”</a> on page 6-19.

Figure 6-17. Mapping Save/Recall Menu

## Measurement Setup Menu

Key Sequence: **Shift** > **Measure** (4) key > More > Coverage Mapping > Measurement Setup

Measurement Setup	<p><b>RSSI:</b> Press this button select Received Signal Strength Indicator (RSSI). This is a basic measurement of the power present in the received signal in zero span and default RBW. Press the RSSI submenu key again to set the dBm levels for RSSI legend and the .kml push pins.</p>
<p>RSSI</p> <p>→</p>	<p><b>ACPR:</b> Press this button to select Adjacent Channel Power Ratio (ACPR). ACPR is the ratio of the power of the adjacent (lower and upper) channel to the main power channel. Press the ACPR key again to set the main channel bandwidth, adjacent channel bandwidth, channel spacing, adjacent channel offset and the power level qualifiers.</p>
<p>ACPR</p> <p>→</p>	<p><b>Back:</b> Returns to the <a href="#">“Coverage Mapping Menu”</a> on page 6-19.</p>
<p>Back</p> <p>←</p>	

**Figure 6-18.** Measurement Setup Menu

## Point Distance/Time Setup Menu

Key Sequence: **Shift** > **Measure** (4) key > More > Coverage Mapping > Point Distance/Time Setup

Points Distance/Time	<b>Repeat Type:</b> Toggles between using a Time or Distance interval for capturing data.
Repeat Type Time Distance	<b>Repeat Time:</b> Sets the time interval when the Time is selected in the Repeat Type button.
Repeat Time 00:00:10	<b>Repeat Distance:</b> Sets the distance interval when the Distance is selected in the Repeat Type button.
Repeat Distance 0.00 m	<b>Distance Units:</b> Toggles the unit of measure between meters and feet.
Distance Units m ft	<b>Back:</b> Returns to the <a href="#">“Coverage Mapping Menu” on page 6-19</a> .
Delete ALL Points	
Back ←	

**Figure 6-19.** Point Distance/Time Setup Menu

Refer to [Chapter 2, “Spectrum Analyzer”](#) for additional spectrum analyzer menus.

# Chapter 7 — AM/FM/PM Analyzer (Option 509)

<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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## 7-1 Introduction

This chapter presents information and procedures that are used to make measurements when using the optional AM/FM/PM Analyzer mode (Option 509).

The AM/FM/PM Analyzer provides display and analysis of the key characteristics of analog AM, FM, and PM modulated signals. The AM/FM/PM Analyzer provides four different displays:

1. **RF Spectrum** shows the RF Spectrum graph, which is similar to Spectrum Analyzer mode with carrier power, carrier frequency, and occupied bandwidth measurements. To get to this view, select the Measurements menu and then press RF Spectrum. To change the occupied bandwidth measurement, press RF Spectrum again and make changes as desired.
2. **Audio Spectrum** shows the demodulated audio spectrum along with the following measurements: Rate, RMS, Pk-Pk/2, SINAD, THD, and Distortion/Total. To change X-axis values to 2 kHz, 5 kHz, 10 kHz, or 20 kHz, press Audio Spectrum again and change Span. When analyzing FM and PM, the reference Y-axis value is also scalable.
3. **Audio Waveform** displays the time-domain demodulated waveform along with Rate, RMS, Pk-Pk/2, SINAD, THD, and Distortion/Total measurements. The X-axis value can be changed by pressing Audio Waveform and changing the Sweep Time. When analyzing FM and PM, the reference Y-axis value is also scalable.
4. **Summary** displays all of the above mentioned measurements from RF Spectrum as well as the demodulated signal.

### Main Menu Keys in AM/FM/PM Analyzer mode:

**Freq Amplitude Setup Measurements Marker**

## 7-2 General Measurement Setup

Please refer to your User Guide for selecting the AM/FM/PM Analyzer mode and for setting up basic functions such as GPS, limit lines, markers, and file management.

While a parameter value is being changed, the value is displayed in red both on the submenu key face and in the sweep window.

1. Connect an antenna that is suitable for the measurements.
2. Press the **Setup** main menu key and then press the **Demod Type** submenu key to toggle the setting to AM, FM, or PM signal analysis. The active setting is underlined on the submenu key face.
3. While in the setup menu, you may choose to set the IFBW or to turn On or Off the automatic IFBW (by pressing the **Auto IFBW** submenu key). The available values for IFBW are: 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, and 300 kHz.

If the Auto IF BW function is On, then manually changing the IFBW turns it Off. When the Auto IF BW function is On, the IFBW is automatically changed to the closest value that is greater than, or equal to, the span. If the span is greater than 300 kHz, then the IFBW is set to 300 kHz.

4. Press the **Freq** main menu key and press the **Center Freq** submenu key to set the desired center frequency, and then press **Set Carrier Freq to Center**. Or, you may also choose a **Signal Standard**, which sets the frequency. Use either [Step 4](#) or [Step 5](#).

<b>Note</b>	If Demod Type is set to FM or PM, then the Set Carrier Freq to Center function aligns the carrier to center only if the carrier is within the IFBW from the center frequency.
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5. Press the **Signal Standard** submenu key to open the list of Signal Standards. Choose a signal standard and press the **Enter** key. The current signal standard is displayed at the top of the sweep window. The frequency is automatically set when the signal standard is selected. Use either [Step 4](#) or [Step 5](#).
6. Press the **Channel** submenu key to open the Channel Editor list box and set a channel.
7. Press the **Span** submenu key to open the Span menu and to set a span value.
8. Press the **Amplitude** main menu key to open the RF Amplitude menu. Here you may set the scale or the power offset.
9. Press the **Measurements** main menu key to open the Measurements menu.
10. From the Measurements menu, choose RF Spectrum, Audio Spectrum, Audio Waveform, or Summary.

<b>Note</b>	Measurement values for SINAD, THD, and Distortion/Total apply only to single tone modulation. For better accuracy of these measurements, the modulation rate should be at least 0.7% of IFBW.
-------------	---

11. If the RF Spectrum graph displays “ADC error”, then press the **Amplitude** main menu key and then press **Adjust Range**. Pressing the **Adjust Range** submenu key sets the Y-axis reference level based upon the signal strength. If the signal is too large (ADC error) or too low, then pressing this key sets the reference level such that the signal is displayed fully within the sweep window. The peak may be close to second grid from the reference.
12. To listen to the audio component of an AM or FM signal, press the **Audio Demod** submenu key. Audio demodulation is not available for PM signals.
13. In the **Audio Demod** menu, press the **On / Off** submenu key turn On or Off the audio demodulation function. A **Demod Type** submenu key is available, as well as a **Volume** submenu key.
14. To save or recall setups or measurements, press the **Shift** key and the **File (7)** key. Setup files are saved with a `.stp` extension, and measurement files are saved with a `.afp` extension.
15. Setups may also be saved or recalled by pressing the **Shift** key and the **Preset (1)** key. Refer to your instrument User Guide for details.

## 7-3 Example FM Demodulation Measurement

1. Press the **Setup** main menu key and then press the **Demod Type** submenu key to toggle the setting to FM. The active setting is underlined on the submenu key face.
2. Press the **Auto IFBW** submenu key to set the IFBW frequency automatically. The active setting is underlined on the submenu key face.
3. Press the **IFBW** submenu key to set the value manually. Doing so will automatically turn Off the **Auto\_IFBW** function. The available values for IFBW are: 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, and 300 kHz.
4. Press the **Freq** main menu key to set the center frequency, the span, the signal standard, or the channel.

From the RF Freq menu, you can press the **Set Carrier To Center** submenu key. This adjusts the signal position within the sweep window.

5. Press the **Amplitude** main menu key to set the scale or the power offset. From the RF Amplitude menu, you can also press the **Adjust Range** submenu key.
6. Press the **Measurements** main menu key to choose the desired type of measurement.
7. From the Measurements menu, you can press the **RF Spectrum** submenu key to view the signal spectrum. Press the submenu again to set specific signal measurement functions.
  - a. Press the **Occ BW Method** submenu key to select the preferred method of presenting the occupied bandwidth, either by percent of the total received signal power or by an amount better than the dBc that is set with the **dBc** submenu key.
  - b. Use the other two submenu keys as needed for signal presentation.
8. Press the **Audio Spectrum** submenu key to view the audio spectrum. Press the submenu again to set the signal span or sweep scale.
9. From the Measurements menu, you can press the **Audio Waveform** submenu key to view the audio waveform. Press the submenu again to set the sweep time or sweep scale.

In this view, you can see the PL tone (or CTCSS tone) at the leading edge of the signal.
10. From the Measurements menu, you can press the **Audio Demod** submenu key to listen to the audio component of the FM signal. In this menu, you can choose wideband or narrowband demodulation, you can set the demodulation time, and you can also set the instrument speaker volume.
11. Press the **Summary** submenu key to view all of the signal characteristics in a table format.

<b>Note</b>	Measurement values for SINAD, THD, and Distortion/Total apply only to single tone modulation. For better accuracy of these measurements, the modulation rate should be at least 0.7% of IFBW.
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## 7-4 AM/FM/PM Analyzer Menus

The AM/FM/PM Analyzer controls are accessed in the menus. The menus that are opened by the 5 main menu keys are shown [Figure 7-1](#).

### Map of Main Menus

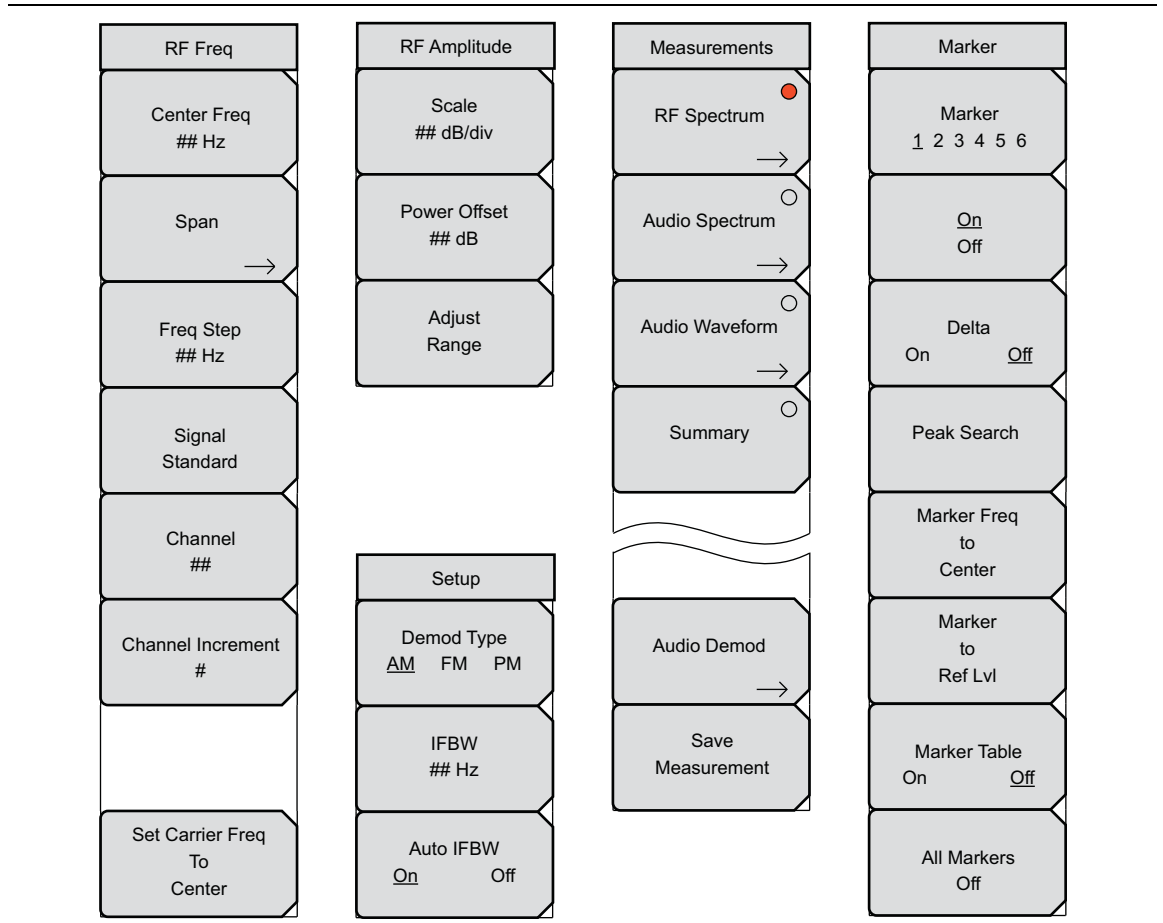


Figure 7-1. Main Menus with AM/FM/PM Analyzer (Option 0509)

Map of Frequency Menus

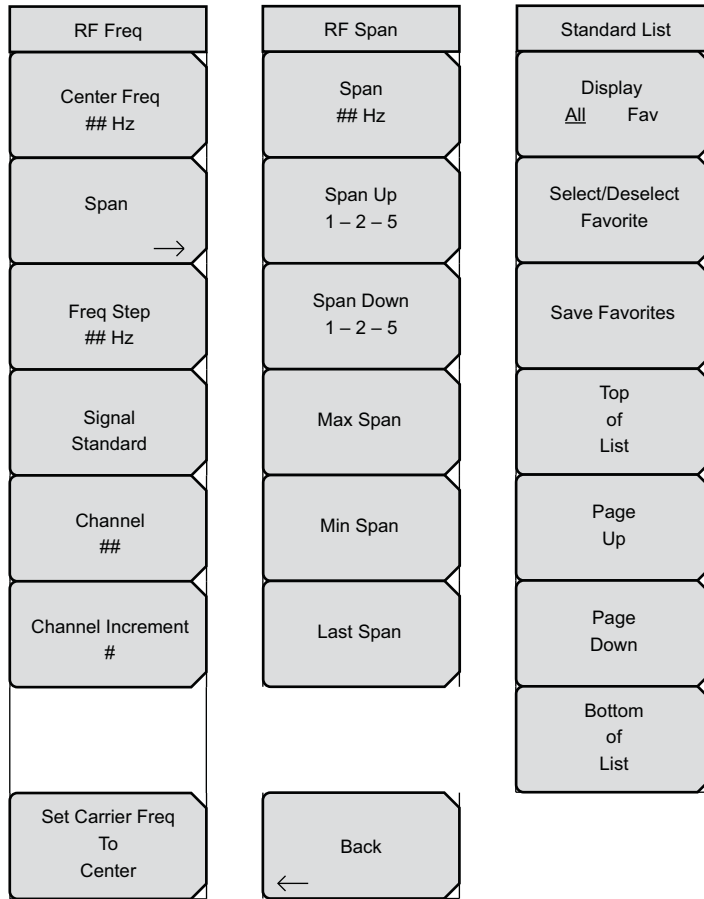


Figure 7-2. Frequency Menus with AM/FM/PM Analyzer (Option 0509)

Map of Measurements Menus

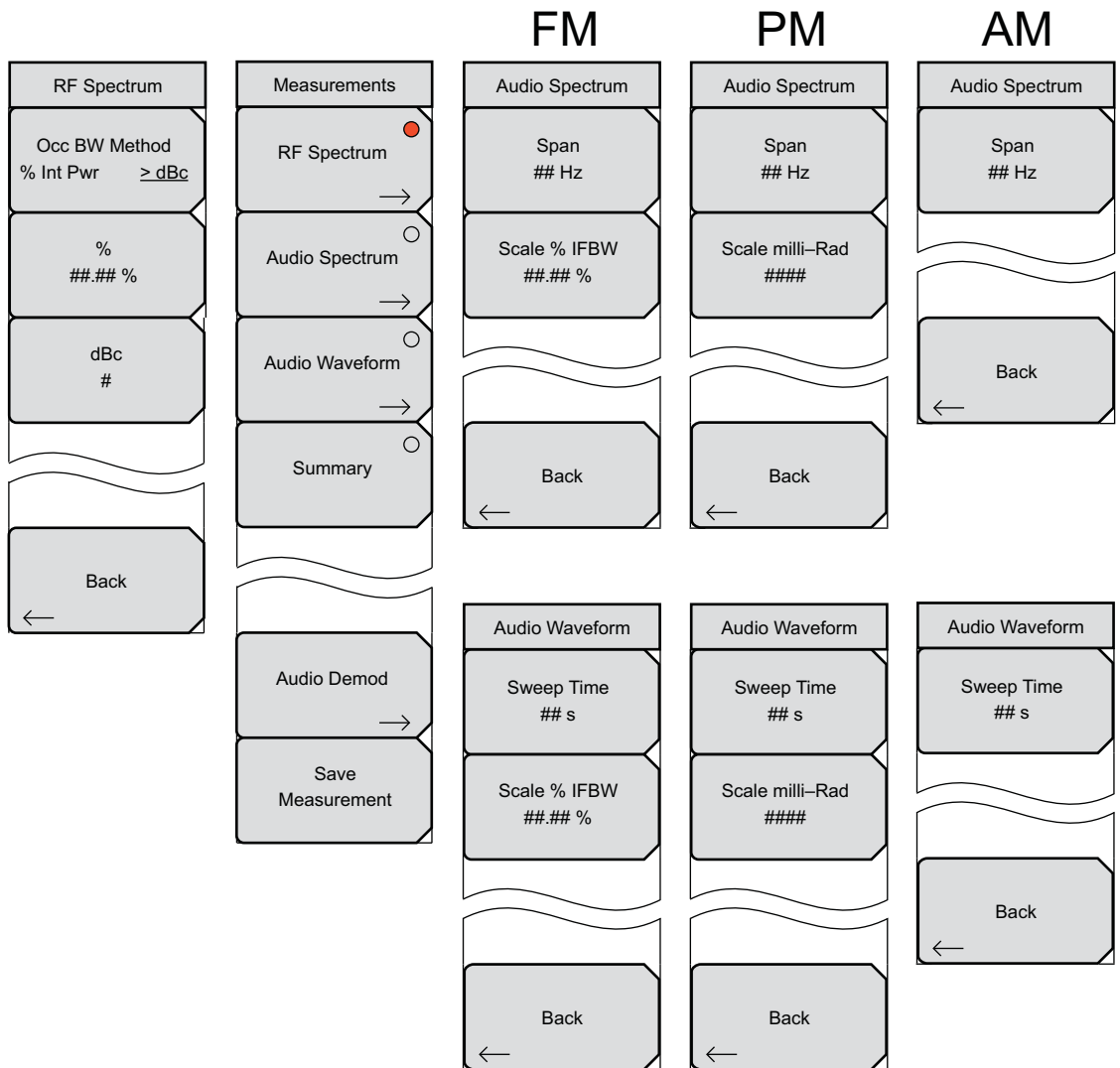


Figure 7-3. Measurements Menus with AM/FM/PM Analyzer (Option 0509)

Map of Audio Demod Menus

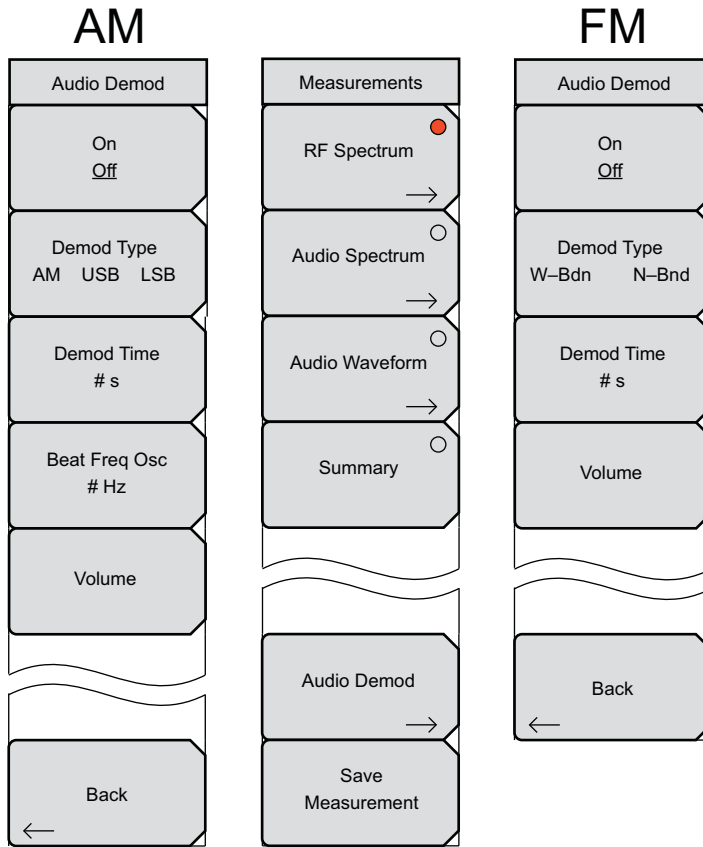


Figure 7-4. Audio Demod Menus with AM/FM/PM Analyzer (Option 0509)

## 7-5 RF Freq (Frequency) Menu

Key Sequence: **Freq**

RF Freq	<p><b>Center Freq:</b> Press to set the frequency that you desire to measure to be in the center of the sweep window. Enter the desired frequency by using the keypad, the arrow keys, or the rotary knob. If entering a frequency by using the keypad, then 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 pressing the MHz submenu key.</p>
Center Freq ## Hz	
Span →	<p><b>Span:</b> Press to open the Span menu ("<a href="#">RF Span Menu</a>" on page 7-10). 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 product will support. See the product specifications for the maximum frequency. Span can also be set to zero span.</p>
Freq Step ## Hz	
Signal Standard	<p><b>Step Freq:</b> Press to set to enter the desired frequency step size. The frequency step specifies the amount by which a frequency will change when the Up/Down arrow keys are pressed. The center frequency value can be changed by using Freq Step. The active parameter will be changed by the frequency step when the <b>Up/Down</b> arrow keys are pressed. If Freq Step is the active parameter, nothing happens when the arrow keys are pressed. The frequency step size can be any value from 1 Hz to the upper limit of the instrument with a resolution of 1 Hz. Use the keypad or the rotary knob to change the Frequency Step size.</p>
Channel ##	
Channel Increment #	
	<p><b>Signal Standard:</b> Press to select a signal standard from the list of available standards. You can edit this list of Signal Standards by using Master Software Tools. Use the rotary knob or the arrow keys to scroll to the desired standard, and then press the <b>Enter</b> key. Or press the <b>Esc</b> key to abort and exit without a change. Refer to the ("<a href="#">Signal Standard List Menu</a>" on page 7-11).</p>
Set Carrier Freq To Center	<p><b>Channel:</b> Press 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.</p>
	<p><b>Channel Increment:</b> Press to set the increment value for the Channel # submenu key</p>
	<p><b>Set Carrier Freq To Center:</b> Press to set the carrier frequency to the center of the sweep window. If Demod Type is set to FM or PM, then the Set Carrier Freq to Center function aligns the carrier to center only if the carrier is within the IFBW from the center frequency.</p>

**Figure 7-5.** RF Freq Menu

## 7-6 RF Span Menu

Key Sequence: **Freq** > **Span**

RF Span	<p><b>Span:</b> Press to set the RF Span. If you use the numeric keypad to enter a value, then the submenu keys change to Units of GHz, MHz, kHz, or Hz. Pressing the <b>Enter</b> key is the same as pressing the MHz submenu key. You may also use the rotary knob or the arrow keys, then press the <b>Enter</b> key.</p>
Span ## Hz	<p><b>Span Up:</b> Press to increase the Span. If starting at 10,000 kHz, the span increases to 20,000 kHz, 50,000 kHz, 100,000kHz, 200,000kHz, 500,000 kHz, 1000 Mhz, 2000 Mhz, and 5000 MHz. Each press of this submenu key increases the span to one of these listed values.</p>
Span Up 1 – 2 – 5	<p><b>Span Down:</b> Press to decrease the Span. If starting at 5,000 MHz, then span decreases to 2000 Mhz, 1000 Mhz, 500,000 kHz, 200,000kHz, 100,000kHz, 50,000 kHz, 20,000 kHz, and 10,000 kHz. Each press of this submenu key decreases the span to one of these listed values.</p>
Span Down 1 – 2 – 5	<p><b>Max Span:</b> Press to set the span to 5,000 MHz, the maximum value.</p>
Max Span	<p><b>Min Span:</b> Press to set the span to 5,000 kHz, the minimum value.</p>
Min Span	<p><b>Last Span:</b> Press to set the span to the previously set span value.</p>
Last Span	<p><b>Back:</b> Press to return to the RF Freq menu.</p>
Back ←	

**Figure 7-6.** RF Span Menu

## 7-7 (Signal) Standard List Menu

Key Sequence: **Freq** > Signal Standard

Standard List	<b>Display</b>
Display <u>All</u> Fav	<b>All Fav:</b> Press to display all available signal standards, or just those that have been marked as favorites. The current setting is underlined on the submenu key face.
Select/Deselect Favorite	<b>Select/Deselect Favorite:</b> Press to mark (select) or unmark (deselect) signal standards in the Signal Standards list box.
Save Favorites	<b>Save Favorites:</b> Press to save any selections (or de-escalations) in the list.
Top of List	<b>Top of List:</b> Press to move the list display to show the first (top of list) standards.
Page Up	<b>Page Up:</b> Press to move through the list one page at a time.
Page Down	<b>Page Down:</b> Press to move through the list one page at a time.
Bottom of List	<b>Bottom of List:</b> Press to move the list display to show the last (bottom of list) standards.

**Figure 7-7.** (Signal) Standard List Menu

## 7-8 Amplitude Menu

Key Sequence: **Amplitude**

RF Amplitude	<b>Scale:</b> Press to set the scaling factor in dB per division. Use the rotary knob, the arrow keys, or the numeric keypad, then press the <b>Enter</b> key.
Scale ## dB/div	<b>Power Offset:</b> Press to set the power offset in dB. Use the rotary knob, the arrow keys, or the numeric keypad, then press the <b>Enter</b> key.
Power Offset ## dB	<b>Adjust Range:</b> Press to change the reference level if the signal strength is too high (ADC error) or too low.
Adjust Range	

**Figure 7-8.** Amplitude Menu



## 7-9 Setup Menu

Key Sequence: **Setup** or **(Shift + 3)**





Setup	
Demod Type <u>A</u> M FM PM	<p><b>Demod Type</b> <b>AM FM PM:</b> Press to set the demodulation type to one of these three options. The selection toggles through the three choices, and the current setting is underlined on the submenu key.</p>
IFBW ## Hz	<p><b>IFBW:</b> Press to set the intermediate frequency bandwidth (IFBW) and use the number keypad, the arrow keys, or the rotary knob to set the value. The available values for IFBW are: 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, and 300 kHz.</p>
Auto IFBW <u>O</u> n Off	<p><b>Auto IFBW</b> <b>Off On:</b> Press to turn On or Off the automatic selection of the intermediate frequency bandwidth (IFBW). The selection toggles between the two choices, and the current setting is underlined on the submenu key.</p>

**Figure 7-9.** Setup Menu

## 7-10 Measurements Menu

Key Sequence: **Measurements** or **(Shift + 4)**

The measurements that are displayed by the choices in this menu are AM or FM or PM, depending upon the demodulation type that you select from the Setup menu.

Measurements	
RF Spectrum 	<b>RF Spectrum:</b> Press to turn On the RF Spectrum measurement. The circle on the submenu key face is red when the measurement is active. When the circle is red, press this submenu key again to open the RF Spectrum menu.
Audio Spectrum 	<b>Audio Spectrum:</b> Press to turn On the Audio Spectrum measurement. The circle on the submenu key face is red when the measurement is active. When the circle is red, press this submenu key again to open the Audio Spectrum menu.
Audio Waveform 	<b>Audio Waveform:</b> Press to turn On the Audio Waveform measurement. The circle on the submenu key face is red when the measurement is active. When the circle is red, press this submenu key again to open the Audio Waveform menu.
Summary 	<b>Summary:</b> Press to view a summary of the RF Spectrum, Audio Spectrum, and Audio Waveform measurements. The circle on the submenu key face is red when the measurement is active. The results are displayed in table format.
<hr/>	
Audio Demod	<b>Audio Demod:</b> Press to open the Auto Demod menu.
Save Measurement	<b>Save Measurement:</b> Opens the Save menu..

**Figure 7-10.** Measurements Menu

## 7-11 RF Spectrum Menu

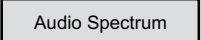
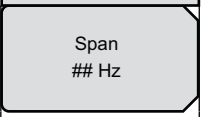

Key Sequence: **Measurements** or **(Shift + 4)** > RF Spectrum > RF Spectrum

RF Spectrum	<b>Occ BW Method</b>
Occ BW Method % Int Pwr <u>&gt; dBc</u>	<b>% Int Pwr &gt; dBc:</b> Press to select a method of presenting the occupied bandwidth, either by percent of the total received signal power or by an amount greater than the dBc that is set with the dBc submenu key. The selection toggles through the choices, and the current setting is underlined on the submenu key.
% ###.### %	<b>%:</b> Press to set the percent for the Occupied BW calculation if the selected Occ BW Method is % Int Pwr.
dBc #	<b>dBc:</b> Press to set the dBc for the Occupied BW calculation if the selected Occ BW Method is > dBc.
Back	<b>Back:</b> Press to return to the Measurements menu.

**Figure 7-11.** RF Spectrum Menu

## 7-12 Audio Spectrum AM Menu

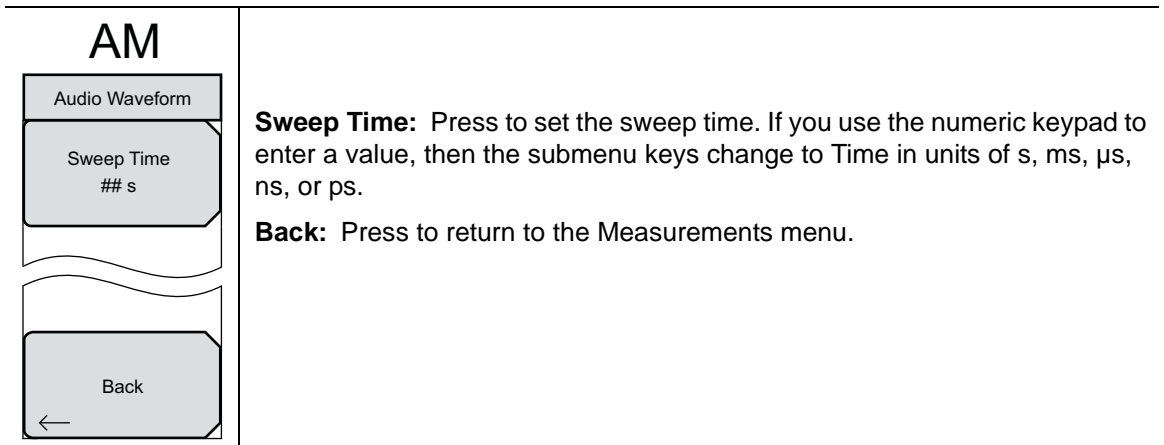
Key Sequence: **Measure** or **(Shift + 4)** > Audio Spectrum > Audio Spectrum

AM	
	<p><b>Span:</b> Press to set the AM audio spectrum span. Use the numeric keypad, the rotary knob, or the arrow keys to set the value. Valid values are 2 kHz, 5 kHz, 10 kHz, and 20 kHz.</p> <p><b>Back:</b> Press to return to the Measurements menu.</p>
	
	

**Figure 7-12.** Audio Spectrum AM Menu

## 7-13 Audio Waveform AM Menu

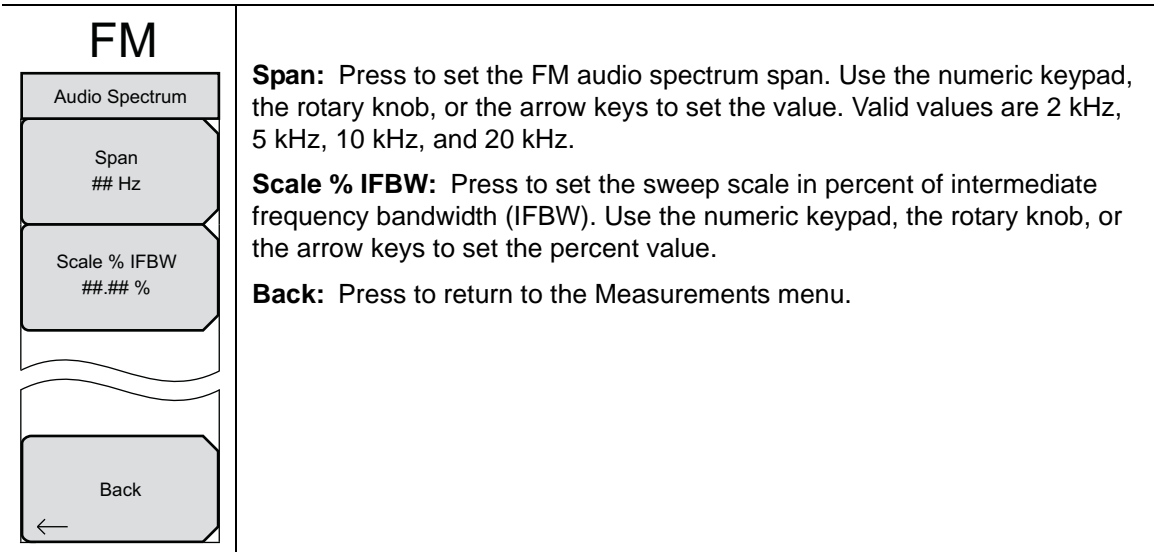
Key Sequence: **Measure** or **(Shift + 4)** > Audio Waveform > Audio Waveform



**Figure 7-13.** Audio Waveform AM Menu

## 7-14 Audio Spectrum FM Menu

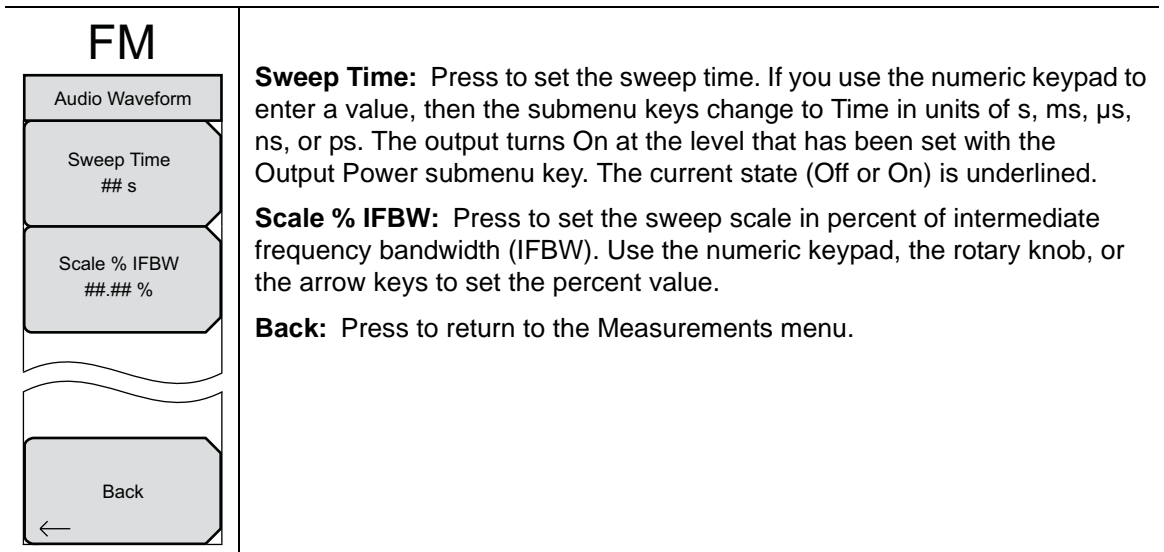
Key Sequence: **Measure** or **(Shift + 4)** > Audio Spectrum > Audio Spectrum



**Figure 7-14.** Audio Spectrum FM Menu

## 7-15 Audio Waveform FM Menu

Key Sequence: **Measure** or **(Shift + 4)** > Audio Waveform > Audio Waveform



**Figure 7-15.** Audio Waveform FM Menu

## 7-16 Audio Spectrum PM Menu

Key Sequence: **Measure** or **(Shift + 4)** > Audio Spectrum > Audio Spectrum

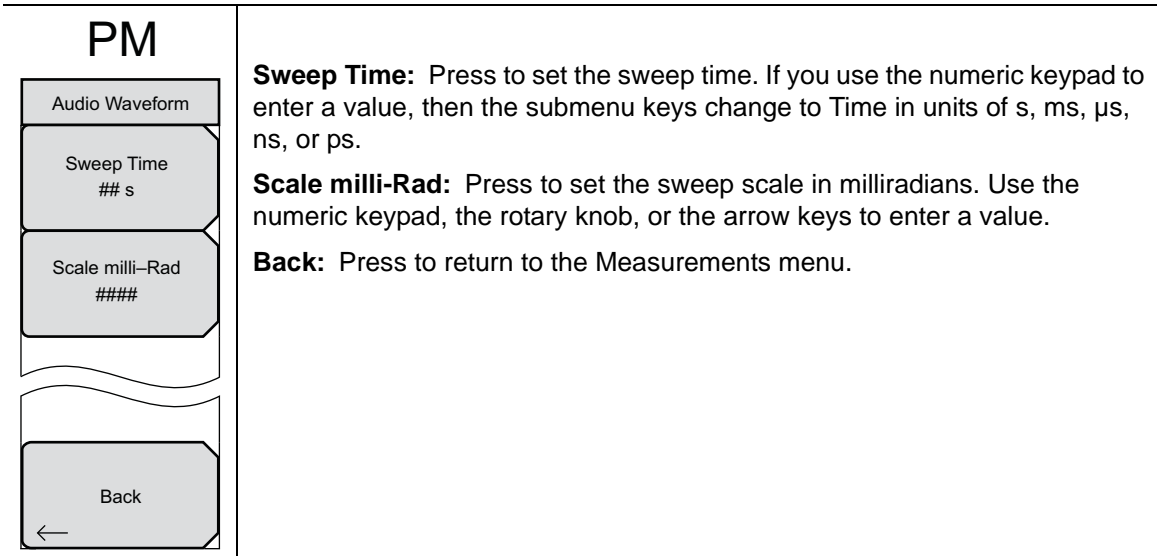
PM	
<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Audio Spectrum</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Span ## Hz</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Scale milli-Rad #####</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Back ←</div>	<p><b>Span:</b> Press to set the PM audio spectrum span. Use the numeric keypad, the rotary knob, or the arrow keys to set the value. Valid values are 2 kHz, 5 kHz, 10 kHz, and 20 kHz.</p> <p><b>Scale milli-Rad:</b> Press to set the scale in milliradians. Use the numeric keypad, the rotary knob, or the arrow keys to enter a value.</p> <p><b>Back:</b> Press to return to the Measurements menu.</p>

**Figure 7-16.** Audio Spectrum PM Menu



## 7-17 Audio Waveform PM Menu

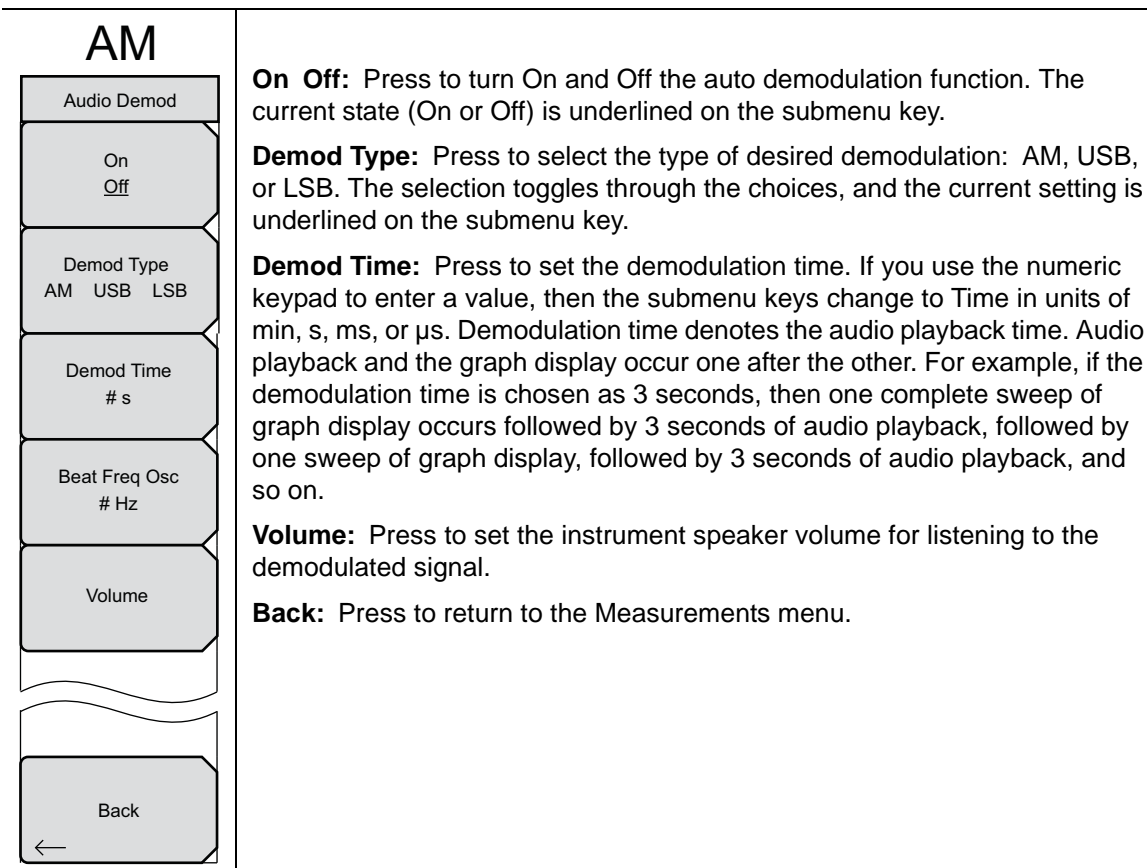
Key Sequence: **Measure** or **(Shift + 4)** > Audio Waveform > Audio Waveform



**Figure 7-17.** Audio Waveform PM Menu

## 7-18 Audio Demod AM Menu

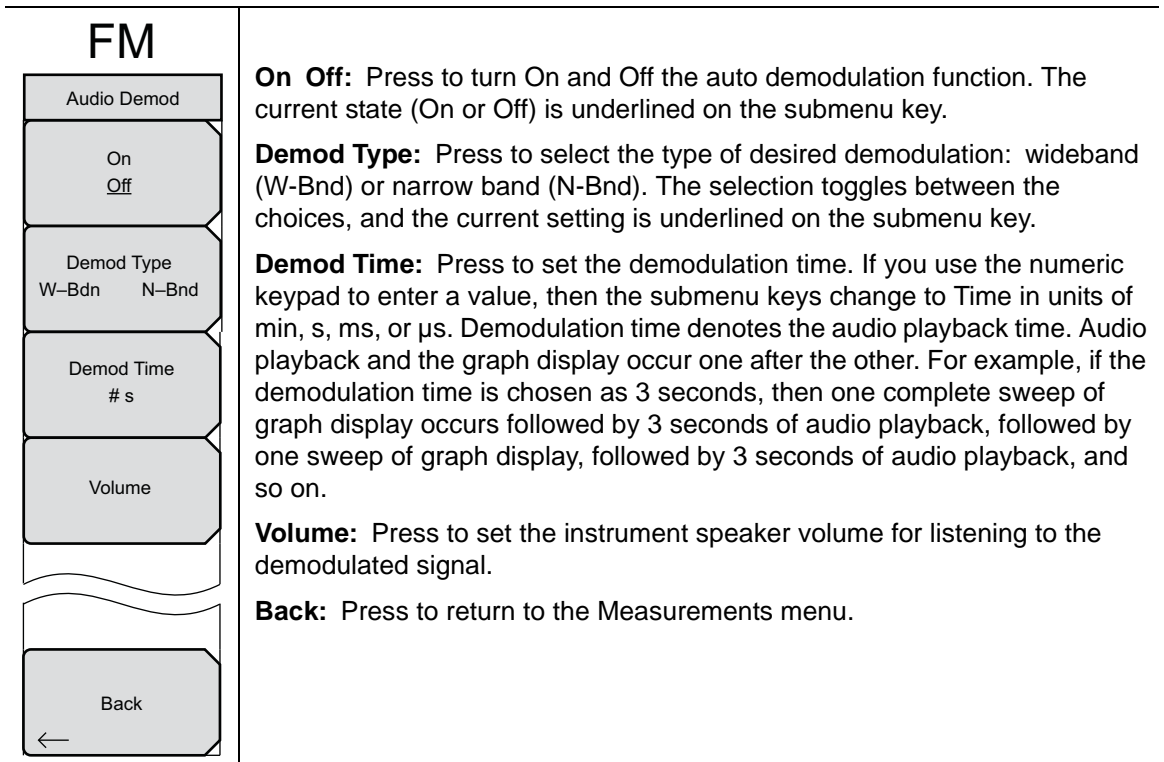
Key Sequence: **Measure** or (**Shift + 4**) > Audio Demod



**Figure 7-18.** Auto Demod AM Menu

## 7-19 Audio Demod FM Menu

Key Sequence: **Measure** or **(Shift + 4)** > Audio Demod



**Figure 7-19.** Auto Demod FM Menu

## 7-20 Marker Menu

Key Sequence: **Marker**

Marker	<p><b>Marker</b>  <b>1 2 3 4 5 6:</b> Press to turn On a specific marker. Each press of the submenu key toggles to the next marker number. The active (selected) marker is underlined on the submenu key.</p>
<p><u>On</u> Off</p>	<p><b>On Off:</b> Press to turn On and Off the selected marker. The current setting is underlined on the submenu key.</p>
<p>Delta On <u>Off</u></p>	<p><b>Delta</b>  <b>On Off:</b> Press to turn On and Off a delta marker. You are prompted for a delta offset frequency, either positive or negative from the frequency of the current active marker. The current setting is underlined on the submenu key.</p>
Peak Search	<p><b>Peak Search:</b> Press to place the currently active marker on the highest signal amplitude that is currently displayed in the sweep window.</p>
Marker Freq to Center	<p><b>Marker Freq to Center:</b> Press to move the frequency that is noted by the active marker to the center frequency position and the center of the sweep window.</p>
Marker to Ref Lvl	<p><b>Marker to Ref Lvl:</b> Press to set the amplitude of the currently active marker as the reference level, which is the top horizontal line in the sweep window.</p>
Marker Table On <u>Off</u>	<p><b>Marker Table</b>  <b>On Off:</b> Press to turn On or Off the marker table, which is 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 delta amplitudes for all markers that have deltas entered for them. The current setting is underlined on the submenu key.</p>
All Markers Off	<p><b>All Markers Off:</b> Press to turn Off all markers.</p>

Figure 7-20. Marker Menu

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