Measurement Guide

Spectrum Analyzer for Anritsu RF and Microwave Handheld Instruments

BTS Master™, Site Master™, Spectrum Master™, Cell Master™, LMR Master™, VNA Master™

Spectrum Analyzer	**Included**
Preamplifier	**Option 8**
Bias Tee	**Option 10**
IQ Waveform Capture	**Option 24**
Interference Analyzer	**Option 25**
Channel Scanner	**Option 27**
CW Generator	**Option 28**
Zero-Span IF Output	**Option 89**
Gated Sweep	**Option 90**
Coverage Mapping	**Option 431**
Electromagnetic Field (EMF)	**Option 444**
AM/FM/PM Analyzer	**Option 509**

Note	Not all instrument models offer every option or every measurement within a given option. Please refer to the Technical Data Sheet of your instrument for available options and measurements within the options.

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NOTICE

UPDATES

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For the latest service and sales contact information in your area, please visit:
http://www.anritsu.com/contact.asp

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 risk from a very dangerous condition or procedure that could result in serious injury or death and possible loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Warning

WARNING ⚠

This indicates a risk from a hazardous condition or procedure that could result in light-to-severe injury or loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Caution

This indicates a risk from a hazardous procedure that could result in loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

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.

Danger

Using Anritsu equipment while a car is in motion could be dangerous and lead to serious accidents.

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 power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Warning

This equipment cannot 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.

Warning

Use two or more people to lift and move this equipment, or use an equipment cart. There is a risk of back injury if this equipment is lifted by one person.

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.

Warning

This product is supplied with a rechargeable battery that could potentially leak hazardous compounds into the environment. These hazardous compounds present a risk of injury or loss due to exposure. Anritsu Company recommends removing the battery for long-term storage of the instrument and storing the battery in a leak-proof, plastic container. Follow the environmental storage requirements specified in the product technical data sheet.

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Chapter 3—Interference Analyzer (Option 25)

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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, IQ Waveform Capture, Coverage Mapping, and AM/FM/PM analysis for Anritsu handheld instruments.

1-2 Selecting a Measurement Mode

Select a measurement mode by pressing **Shift** and then the **Mode** (9) button to open the Mode Selector dialog box. Highlight the desired measurement mode using the **Up** or **Down** arrow keys and press **Enter**.

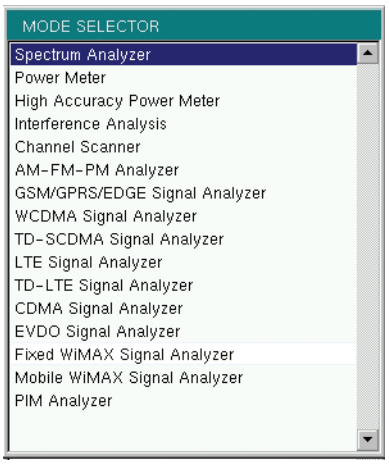


Figure 1-1. Mode Selector Dialog Box

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. The actual menus on your instrument may also differ based on instrument model, firmware version, and installed options.

Some Anritsu handheld instruments also have a **Menu** button which displays icons of installed measurement modes and allows measurement mode selection using the touch screen.

Figure 1-2. Mode Selector Dialog Box

1-3 Contacting Anritsu

To contact Anritsu, please visit:

http://www.anritsu.com/contact.asp

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

Updated product information can be found on the Anritsu website:

http://www.anritsu.com/

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

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 2-8 focus on resolution bandwidth, video bandwidth, sweep, attenuator, and detection functions. Section 2-10 through Section 2-23 cover field measurements including brief examples demonstrating field strength, occupied bandwidth, channel power, adjacent channel power ratio, out-of-band spurious emissions, in-band/out-of-channel, in-band spurious, AM/FM/SSB demodulation, carrier to interference ratio (C/I), emission mask, coverage mapping, and IQ waveform capture. Finally, Section 2-24 though Section 2-37 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 grid increment, 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 Frequency

The tuning frequency range can be entered in several different ways depending upon what makes the most sense, either 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.

Offset Frequency

In addition, a user-defined frequency offset can be entered to adjust the frequency that is displayed on the instrument from the actual swept frequency. For example, if the DUT is an antenna system receiving signals in the 10 GHz range and offsetting the signals to the 1 GHz range, then you can set a frequency offset into the spectrum analyzer in order to display the actual received antenna frequency in the sweep window. For a measurement example, see Figure 2-29, “200 MHz Frequency Offset Example” on page 2-43.

When enabled, Offset is displayed at the bottom of the screen (Figure 2-29), and the Center Freq, Start Freq, and Stop Freq submenu keys indicate that a frequency offset has been turned on by adding the word Offset before Center, Start, and Stop. For menu examples, see Figure 2-25 on page 2-39 and Figure 2-27 on page 2-41.

To remove a frequency offset, set the Freq Offset to 0 Hz.

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.

The RBW range varies with instrument features. Refer to the RBW submenu key description in section "BW (Bandwidth) Menu" on page 2-48, and check your Technical Data Sheet for the RBW range in your instrument.

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, No FFT, or Burst Detect.

Improperly installed cellular boosters can produce interference that is sometimes bursted. Some bugs use burst transmission to make them hard to find. By using Burst Detect mode, a narrow pulsed or bursty signal is easily seen in spectrum analyzer mode. Emitters as narrow as 200 µs can be captured every time. Burst Detect works in a maximum span of 15 MHz.

Figure 2-1 shows two traces. The yellow one is the live trace with Burst Detect sweep mode, while the green one is a max hold trace. Note that there isn't much difference between the two traces. No longer is max hold needed to be able to see narrow pulsed signals.

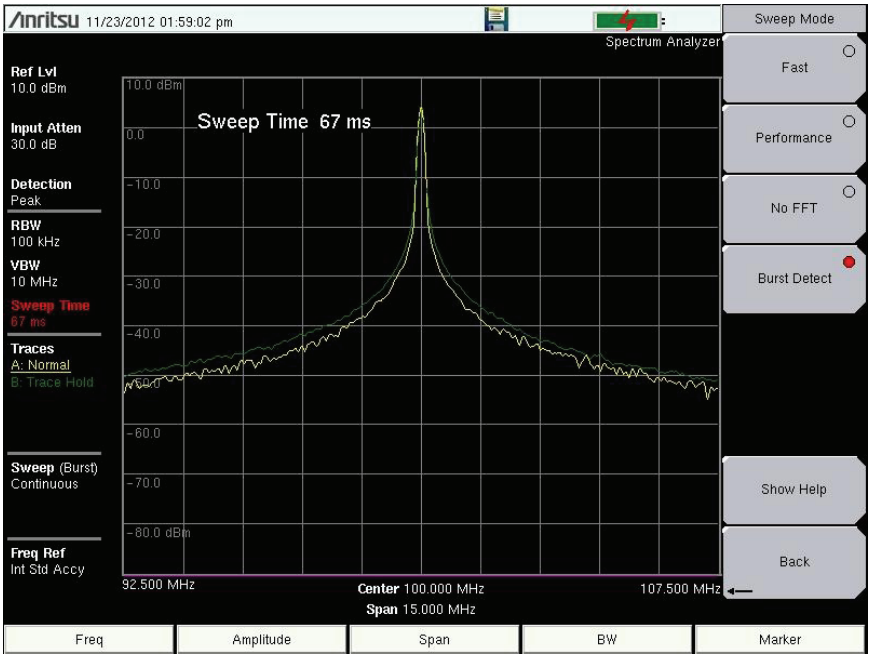


Figure 2-1. Example of Burst Detect Sweep Mode

The Show Help submenu key displays a table detailing the trade-off between sweep speed and performance of the sweep mode options.

Note	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 in zero span, 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 or right arrows to change the setting by 1 dB or the up or down arrows to change the setting by 10 dB.

IF Power (not available on all instruments): This mode is used in zero span to use IF power level as the trigger source. 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, then no trace will be on the screen.

Zero Span IF Output (Option 89): Zero Span IF Output provides an IF signal that is nominally at 140 MHz out of a BNC female connector labeled IF Out 140 MHz or IF Out (option) 140 MHz.

Note	The IF output signal is present only when the spectrum analyzer Span is set to zero and the **Zero Span** button has been pressed a second time to bring up the IF bandwidth menu (refer to "Zero Span IF BW Menu" on page 2-47). The key sequence is: **Span** > **Zero Span** > **Zero Span**.

Note	MS2723B and MS2724B instruments use IF frequency of 37.8 MHz rather than the 140 MHz of other Anritsu Spectrum Masters. IF output bandwidth is limited to 16 MHz. For these MS2723B and MS2724B instruments, the BNC connector is labeled **IF Out 37.8 MHz**.

You can select Normal or any one of four fixed IF bandwidths of 7 MHz, 10 MHz, 16 MHz, or 32 MHz. In Normal, the bandwidth is set by the spectrum analyzer RBW selection (**BW** > Zero Span RBW). When Normal is selected, the IF bandwidth is influenced by the selection of RBW filters, although the digital RBW filters themselves are not employed.

Zero Span IF output effectively uses the spectrum analyzer as a receiver front-end, converting the input signal at the spectrum analyzer RF In connector to a signal centered at 140 MHz out of the IF Out 140 MHz connector. You can then process the IF signal in a way that meets your needs. That may mean using an A-to-D converter or some other signal processing method. An anti-aliasing filter can be employed in the signal processing to reduce the effect of noise and spurious signals. A filter centered on 140 MHz with a bandwidth slightly wider than 32 MHz is also advised to eliminate any undesired out-of-band signals on the IF output. In particular, signals at 100 MHz and its harmonics (that would be eliminated by the filter) are on the IF output.

With Option 89, IF output is turned on by setting the instrument to zero span and pressing the Zero Span submenu key a second time to access the Zero Span IF Bandwidth menu (Figure 2-2).

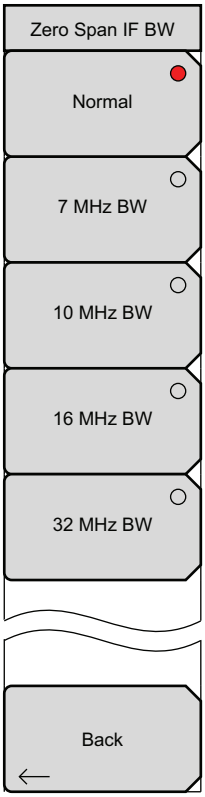


Figure 2-2. Zero Span IF Bandwidth Selection Menu

The Normal IF BW choice selects a bandwidth that uses analog bandpass filters in the normal RBW chain. By changing the RBW, different filter bandwidths are selected.

The spectrum analyzer has several mixer bands. Depending on the operating frequency, the local oscillator may be above or below the input frequency. When the local oscillator frequency is below the input frequency, an increase in the input frequency results in an increase in the IF output frequency. When the local oscillator is above the input frequency an increase in the input frequency moves it closer to the local oscillator frequency and the IF output frequency consequently decreases. Table 2-1 on page 2-7 shows the bands and indicates where the LO frequency is in relation to the RF frequency.

Table 2-1. Mixer Bands and LO Relation to RF Frequency

Band	Low RF MHz	High RF MHz	Local Oscillator Side	Output Spectrum
1	0	5350	High	Inverted
2	5350	9200	High	Inverted
3	9200	13000	Low	Not Inverted
4	13000	16500	High	Inverted
5	16500	20000	Low	Not Inverted
6	20000	32800	High	Inverted
7	32800	43000	Low	Not Inverted

"Inverted" means that the IF is spectrally inverted from the input (as the input frequency goes higher, the IF goes lower).

"Not Inverted" means that the IF is not spectrally inverted (as the input frequency goes higher, the IF goes higher).

You need to take frequency inversion into account when processing the IF signal. Assuming that the IF has been processed to yield I and Q data, inversion is easily done by swapping I and Q.

A residual frequency offset of the IF may exist compared to the RF due to the resolution of the 1st and 2nd local oscillators. Usually this offset will be on the order of several kHz.
To determine the residual offset, you need a second spectrum analyzer:

1. Attach a signal source (or antenna) to the spectrum analyzer and set the center frequency to the center of the signal being received.
2. Press **BW** then Zero Span, and then press Zero Span a second time to turn on the IF output.
3. Attach a second spectrum analyzer to the IF output and set the center frequency to 140 MHz. Set the span of the second spectrum analyzer to 100 kHz or less to have the resolution needed to be able to measure an offset that may be 25 kHz or less.
4. Measure the frequency of the IF signal to see how far the signal is offset from 140 MHz.

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 2-3)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.

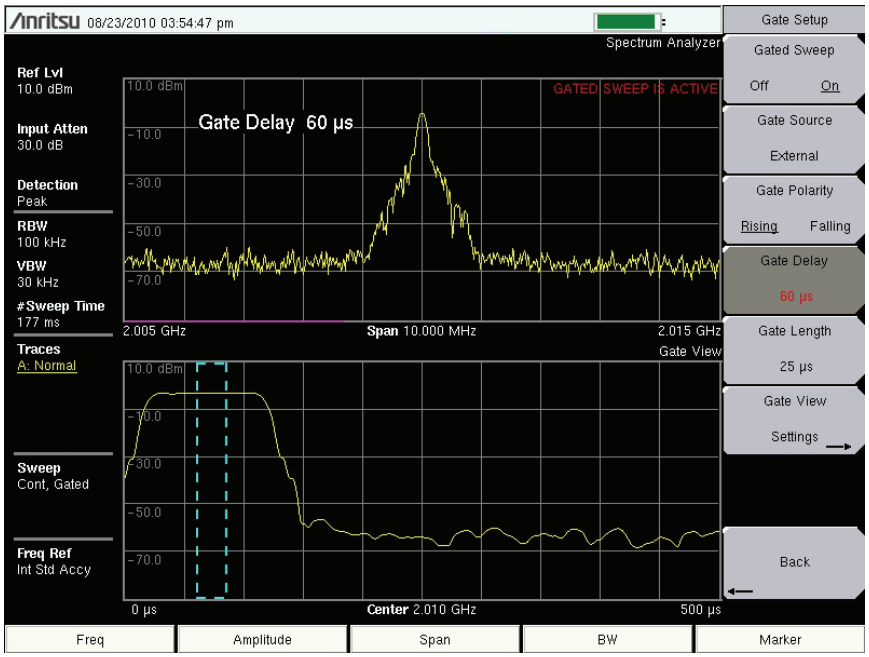


Figure 2-3. Gated Sweep Example

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 µs 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 or 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, several measurement points are calculated 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/Avg: This method performs a root-mean-square calculation of all the measurement points in each display point. This 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.

The key sequence to set a detection method is: **Amplitude** > Detection.

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

The preamplifier can be turned on and off by pressing the **Amplitude** main menu key, then selecting the Preamp On/Off submenu key.

Figure 2-4 show the noise floor with the preamplifier off (green trace) and on (yellow trace). Notice that when the preamplifier is turned on, the noise floor drops significantly.

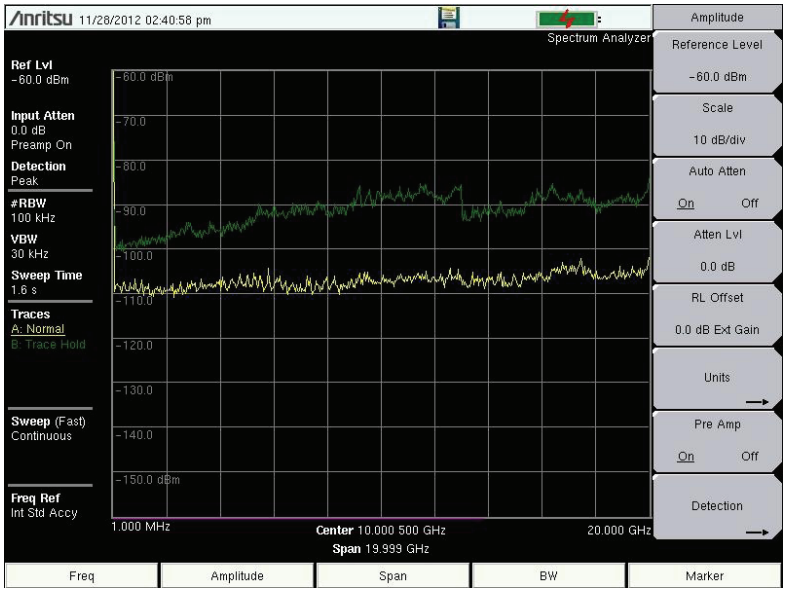


Figure 2-4. Preamplifier On and Off

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, emission mask, 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** (**4**) key. Then press the Power and Bandwidth submenu key, and 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 to display the loaded antenna profiles with their model number and frequency range. Use the up or down arrow keys or the rotary knob to select the desired antenna. Press the **Enter** key to select or **ESC** to cancel.

Note	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^2, dBV/m, dBmV/m, dBµV/m, Volt/m, Watt/m^2, dBW/m^2, A/m, dBA/m, or Watt/cm^2. 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 1mW = 10^{-3} W and 1 µV = 10^{-6} V.

For power in dBm, and voltage in dB (µV):

$V_{dB(\mu V)} = P_{(dBm)} + 107$ 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 W/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 W/m
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
- 30 dB, 50 Watt, bi-directional, DC –18 GHz, N(m) – N(f), Attenuator (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 effect as the MHz submenu key.
3. If an attenuator was connected in Step 1, then 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. Then press the Power and Bandwidth submenu key, and press 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 2-5 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.

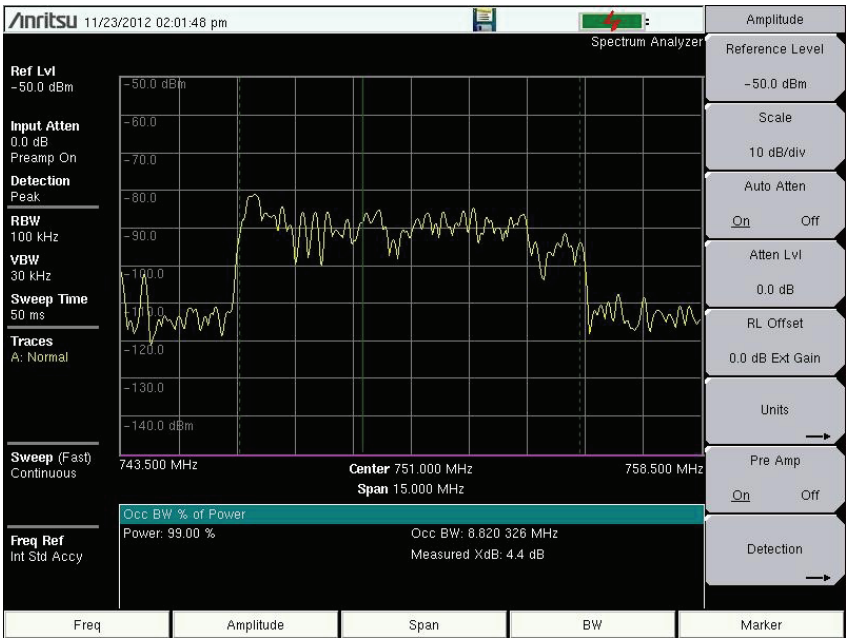


Figure 2-5. Occupied Bandwidth Results Using the % of Power Method

2-13 Channel Power Measurement

Channel power measurement is one of the 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. Press the **Shift** key then the **Measure** (4) key. Then press the Power and Bandwidth submenu key, and 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. A number of frequency bands that are allocated to GSM mobile phones 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

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 up or down arrow keys or the rotary knob 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. Then press the Power and Bandwidth submenu key, and press the Channel Power submenu key.
8. Verify that the center frequency is set to that of the GSM signal, in this case 947.0 MHz by looking at the center frequency annotation on-screen.
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, the Power and Bandwidth submenu key, and 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 to 18 GHz, N(m)–N(f) Attenuator (if required for the power level being measured)
- Test Port extension cable

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 Step 12. If the signal standard and channel are not known, follow the procedure in Step 7 through Step 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. Then press the Power and Bandwidth submenu 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 EMF Measurement (Option 444)

Required Equipment

- Anritsu isotropic antenna

Procedure

1. Connect the antenna to the RF In test port.
2. Press the **Freq** main menu key, then enter the desired start and stop frequencies using the Start Freq and Stop Freq submenu keys. Alternatively, you can select the center frequency and span by pressing the associated submenu keys and entering the desired values.
3. Press the **Shift** key followed by the **Measure** (**4**) key.
4. To turn EMF On, press the Power and Bandwidth submenu key, then EMF Measurement followed by the On/Off submenu key so that On is underlined.

Note	The measurement will turn On only if the start and stop frequencies are within the frequency range of the spectrum analyzer and isotropic antenna used. For specifications, refer to the product technical data sheets.

Refer to Chapter 9, "EMF (Option 444)" for instructions on how to connect the isotropic antenna to the spectrum analyzer and for a description of the EMF Measurement menu.

2-16 Out-of-Band Spurious Emission Measurement

Required Equipment

- Test Port extension cable

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.

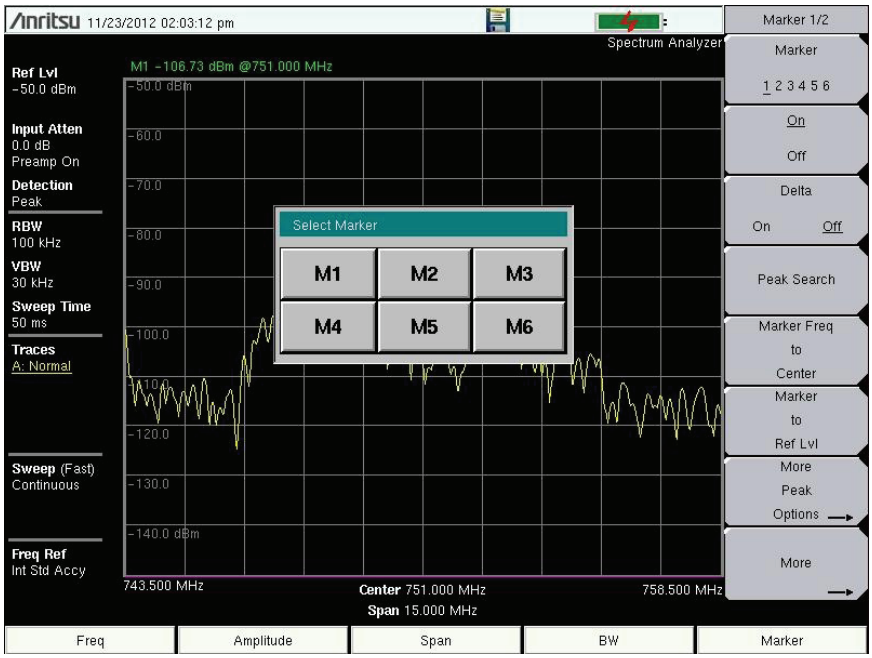


Figure 2-6. Select Active Marker (Touch Screen Models)

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 Step 8 and Step 9 for the remaining spurs. Use either Marker 1 again, or choose another marker. Figure 2-7 shows a simulated out-of-band spurious signal 3 MHz from the carrier using a delta marker.

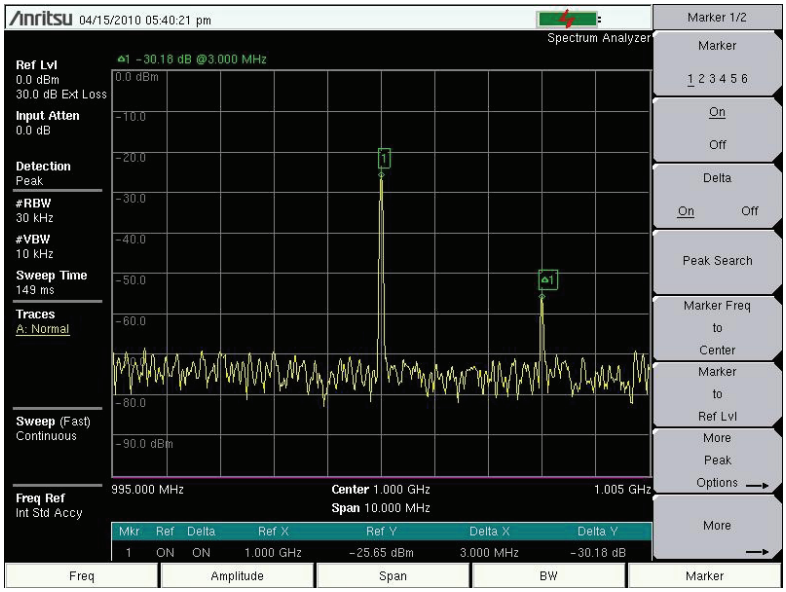


Figure 2-7. Out-of-Band Spurious Emission Measurement

2-17 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

2-18 In-band Spurious Measurement

Required Equipment

- 30 dB, 50 watt, Bi-Directional, DC to 18 GHz, N(m)–N(f), Attenuator
- Test Port extension cable

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.

2-19 AM/FM/SSB Demodulation

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

Procedure

1. Press the **Shift** key followed by the **Measure** (**4**) key. Then press the AM/FM Demod submenu key.
2. Press the Demod Type submenu key and press 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 ± 10000 Hz.
5. Press the On/Off submenu key to enable the demodulation.
6. Press the Volume submenu key and use the up or down arrow keys or the 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 that the unit will demodulate the signal. Enter a value from 100 ms to 500 seconds.

2-20 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. Then press the Masks and C/I submenu key, and then the C/I submenu key.
4. Press the Center Freq (or Offset 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. The minimum sweep time for a valid measurement is displayed in the Min Sweep Time submenu key.
7. Press the On/Off submenu key and follow the on-screen prompts to complete the measurement.

Note	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 2-8), with the carrier measured (Figure 2-9), and the measurement results (Figure 2-10).

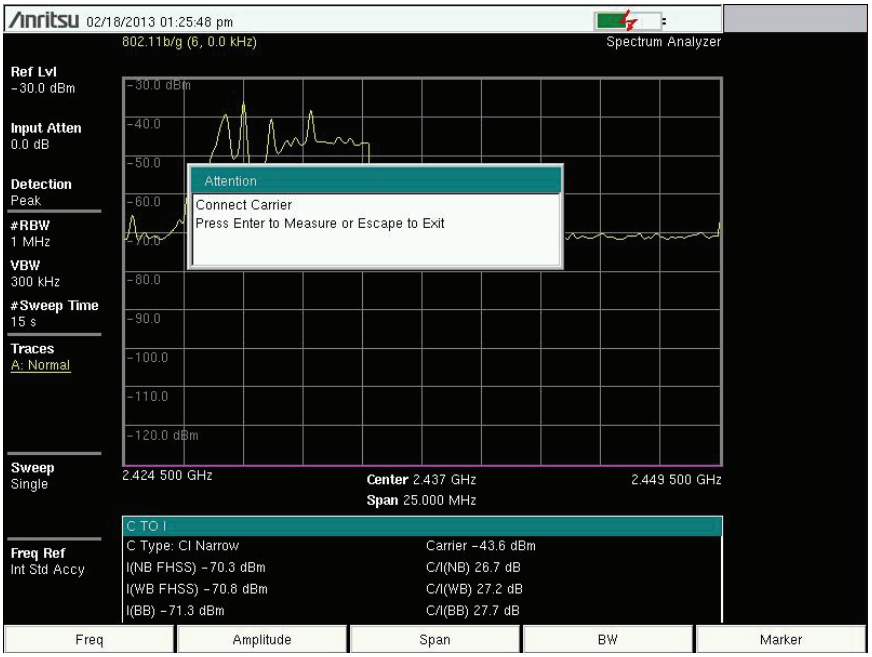


Figure 2-8. C/I Measurement, Ready to Measure the Carrier

Figure 2-9. C/I Measurement, Carrier Measured

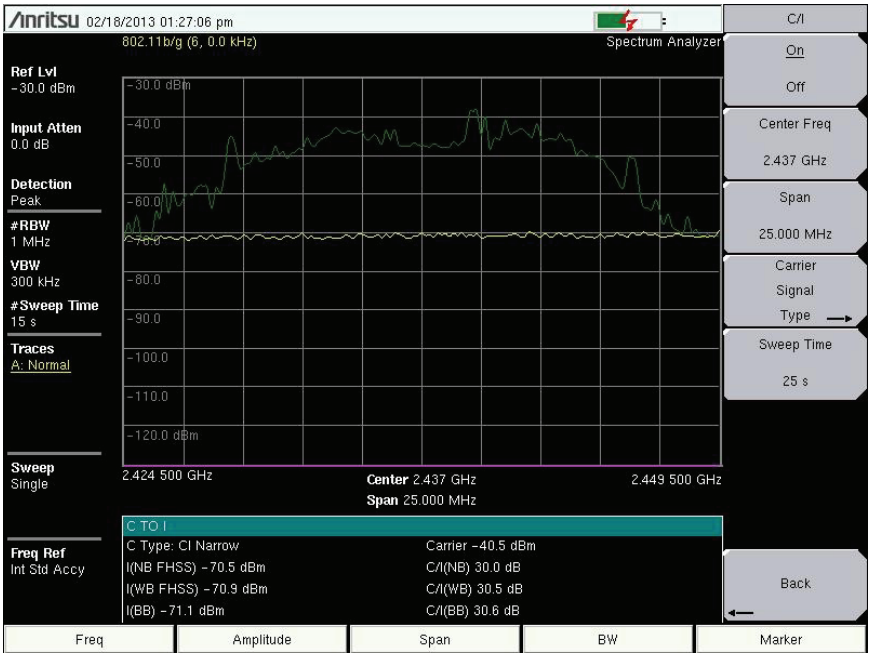


Figure 2-10. C/I Measurement, Results

2-21 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 2-35 “Limit Menu” on page 2-79 for details on the Limit menu.
2. Press the **Shift** key followed by the **Measure** (**4**) key,. Then press the Masks and C/I submenu key, and then the Emission Mask submenu key.
3. Press the Emission Mask On/Off submenu key to turn Emission Mask On.

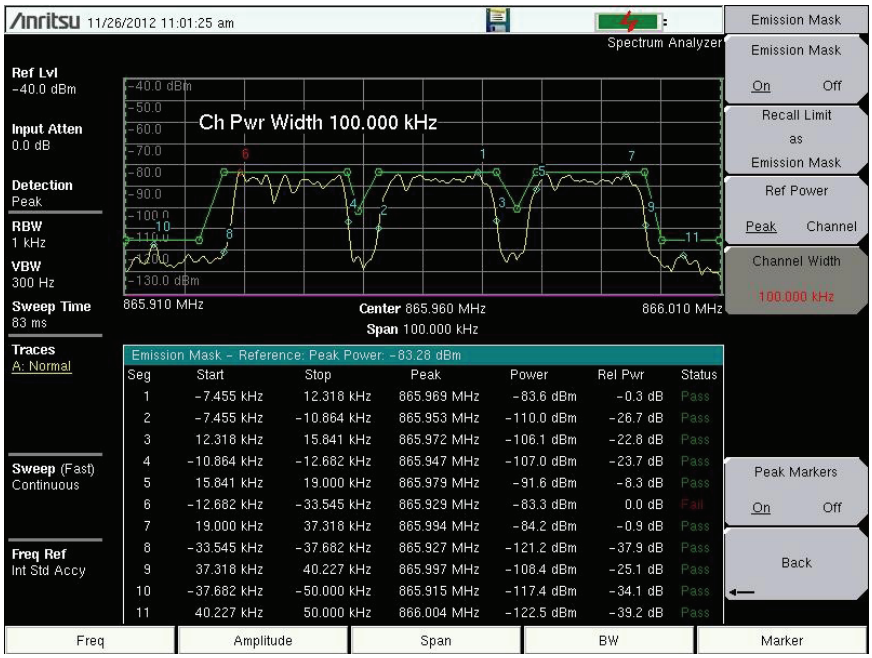


Figure 2-11. Emission Mask

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

2-22 Coverage Mapping

To initiate Coverage Mapping, press the **Shift** key followed by the **Measure** (**4**) key, then press the Coverage Mapping submenu key. For a description of Coverage Mapping, refer to Chapter 6, “Coverage Mapping”.

2-23 IQ Waveform Capture (Option 24)

(for MT8221B and MS272xC instruments)

Option 24, IQ Waveform Capture, captures the raw data for the set center frequency and for the duration of the set capture length. This section includes instructions for setting up the instrument, capturing a waveform, and saving it to the instrument, or using the MATLAB script to read the captured waveform and to save it to a PC.

For remote setup and waveform capture, please refer to the *BTS Master MT8221B, MT8222B Programming Manual* (10580-00208) or the *Spectrum Master MS2722C, MS2723C, MS2724C, MS2725C and MS2726C Programming Manual (10580-00278)*. Each includes SCPI commands for instrument remote control, waveform set up and capture, and two sample scripts: MATLAB and C++. The MATLAB script is used to read a WCAP file from the instrument and unpack the data into a MATLAB array. The C++ sample program uses the SCPI commands to initiate a capture and save it directly to the PC.

Waveform Capture Setup

1. Press the **Shift** key and then the **Measure** (**4**) key on the instrument to open the Measure menu.
2. Press the IQ Waveform Capture submenu key (which is displayed only if Option 24 is installed on your instrument) to open the IQ Waveform Capture menu.
3. Press the Capture Length submenu key to set the length of time that data is taken.
4. Press the Capture Mode submenu key and select either Single or Continuous. Selecting Single will perform 1 capture when Start Capture is pressed. When Continuous is selected, multiple waveform captures (that are the time length set in Capture Length) are taken until the Start Capture button is pressed to end the waveform capture process.
5. Press the Sample Rate submenu key to set the desired capture rate. Bandwidths are also displayed for each sample rate. Select the desired sample rate in the Select Capture Sample Rate list box (Figure 2-12) with the arrow keys or rotary knob and press **Enter**.

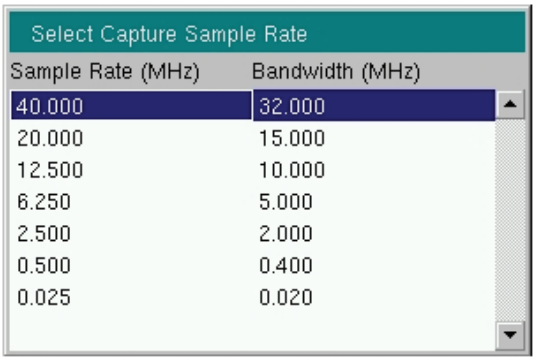


Figure 2-12. IQ Capture Sample Rate

6. Press the Triggering submenu key to open the Capture Triggering menu. Set the Source, Slope and Delay parameters. Press Back to return to the IQ Waveform Capture menu.

7. Press the File Name & Location submenu key to open the Save menu. Set up the folder where the saved captured data will be placed by pressing the Capture Location submenu key. Set up a captured waveform filename using the File Name (Prefix) submenu key. Refer to "IQ Capture Save Menu" on page 2-72 for additional information on Capture Location and File Name (Prefix).
8. Press the Frequency/Amplitude submenu key to set up the frequency parameters of the waveform to be captured. The Freq/Amp menu opens. Set the frequency, span, reference level and scale for the y-axis, and attenuation settings for the waveform capture.

Note	When setting the Span, set it slightly larger than the captured bandwidth. This allows you to see what you are capturing within the display. A good value to start with is 125% of the captured bandwidth. Setting the Span this way does not affect the bandwidth of the captured signal.

Capturing a Waveform

Press the Start Capture submenu key. If Capture Mode was set to Single, a single waveform capture will be taken. If Continuous is selected, waveform capturing ends when the Stop Capture (initial state Start Capture) button is pressed. When Stop Capture is pressed, the current capture cycle will be completed and then IQ capture will end. The captured waveform is named and stored in the file location set by File Name (Prefix) and Capture Location.

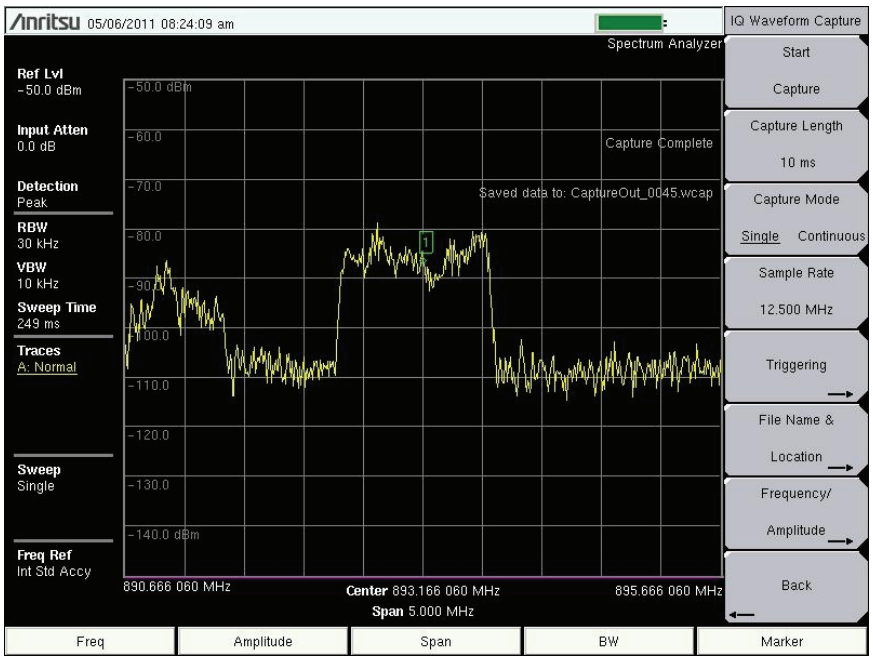


Figure 2-13. IQ Waveform Capture

2-24 Spectrum Analyzer Menus

Figure 2-14 though Figure 2-24 show the map of the Spectrum Analyzer menus. The following sections describe Spectrum Analyzer 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. Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to menu descriptions).

Main Menu Keys are used to display the highest-level submenu key menus. Note that the **Marker** and **Measurements** menus are on the following pages.

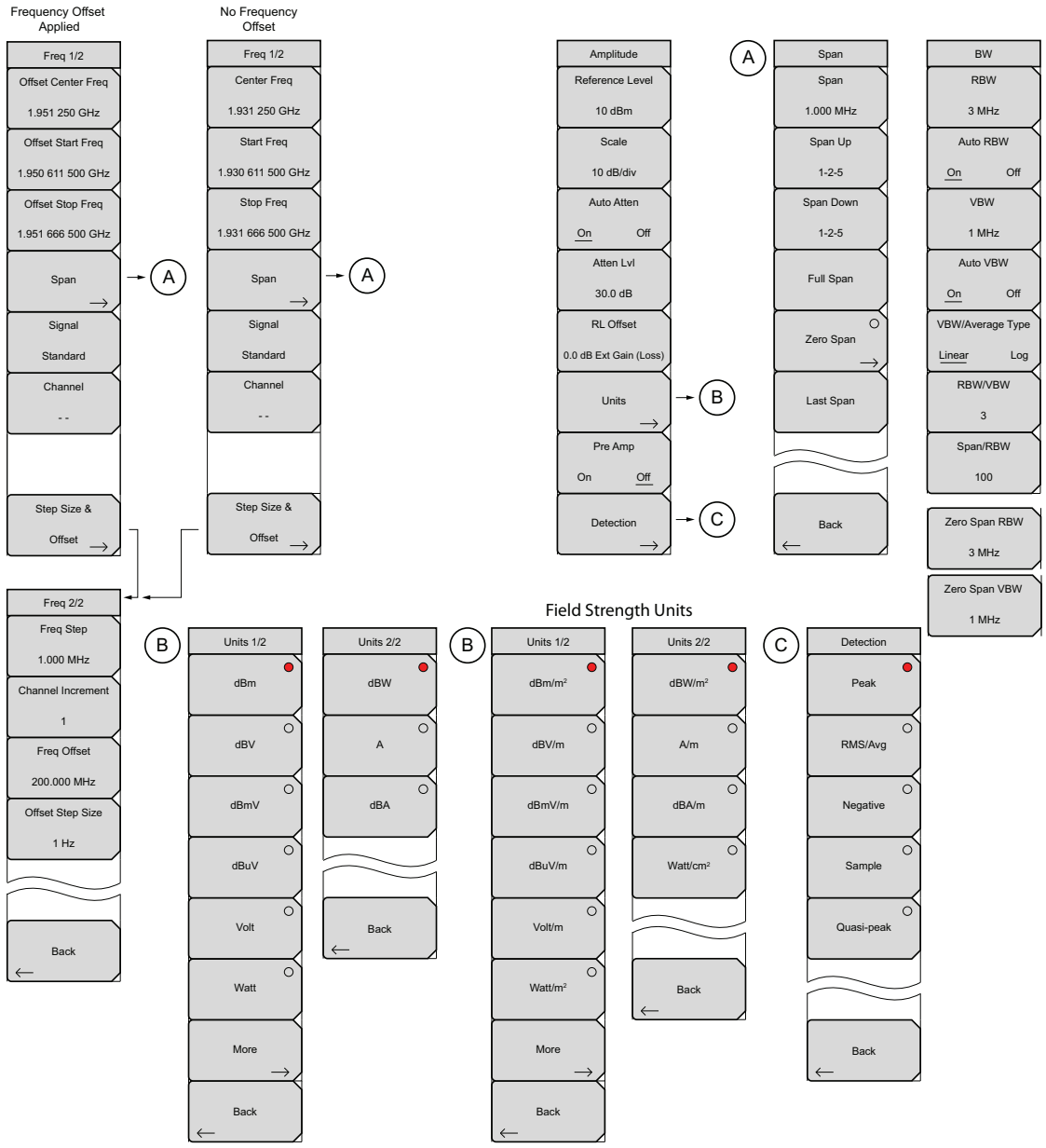


Figure 2-14. Main Menu Keys

Marker Menus

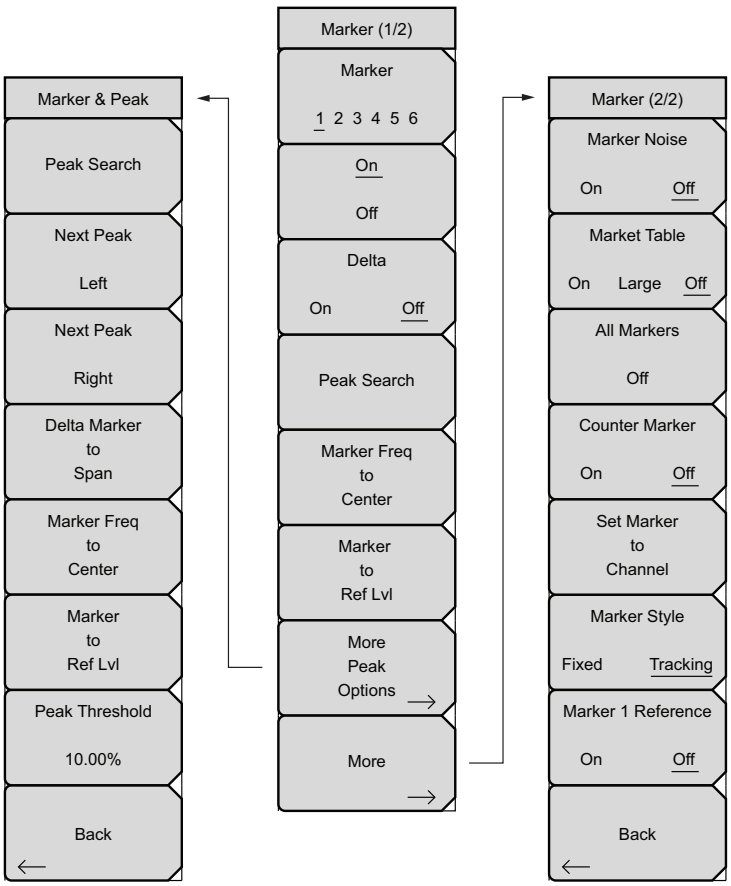


Figure 2-15. Marker Submenu Keys

Measure Menu (1 of 5)

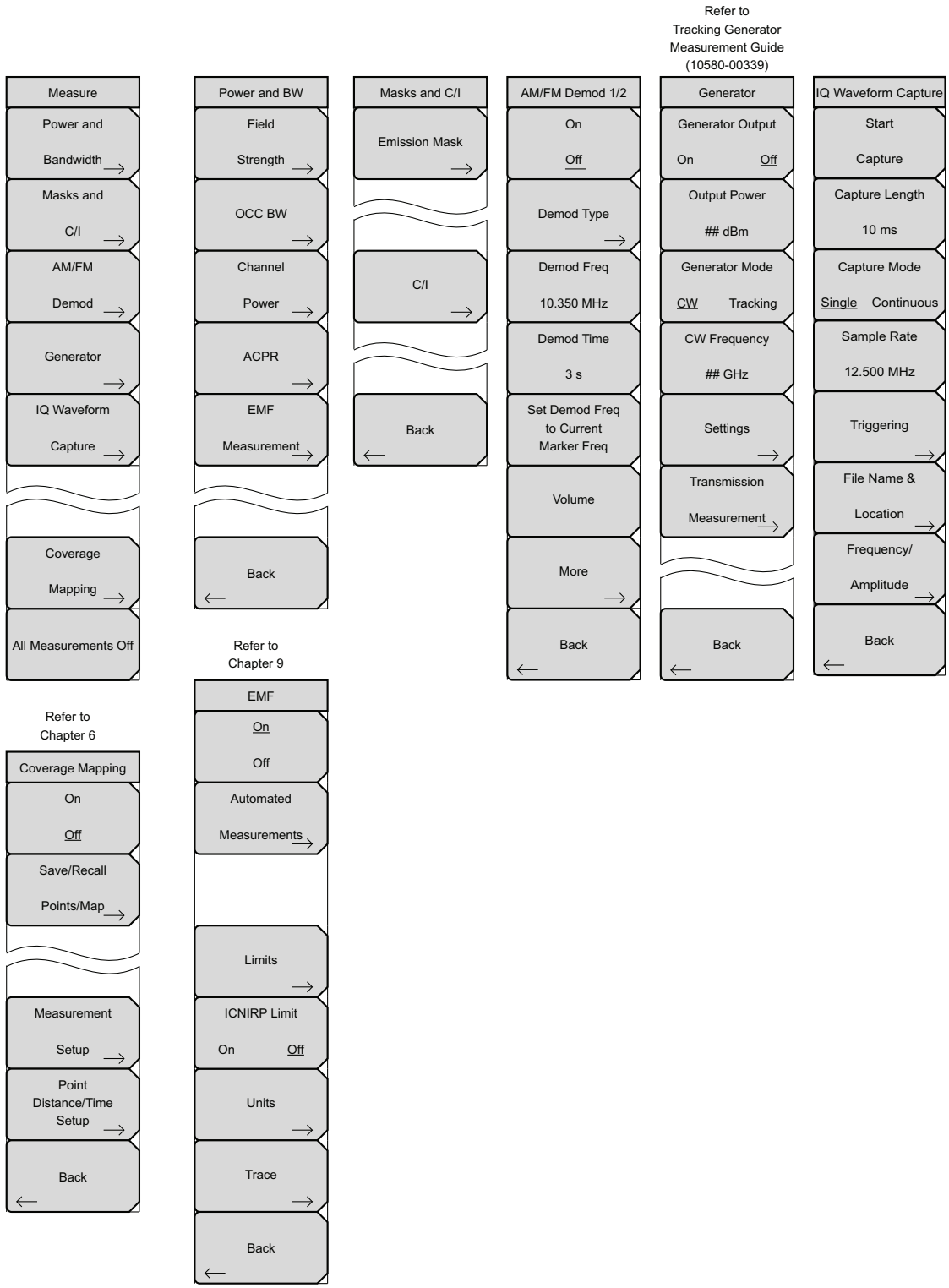


Figure 2-16. Measure Submenu Keys — Measure

Measure Menu (2 of 5)

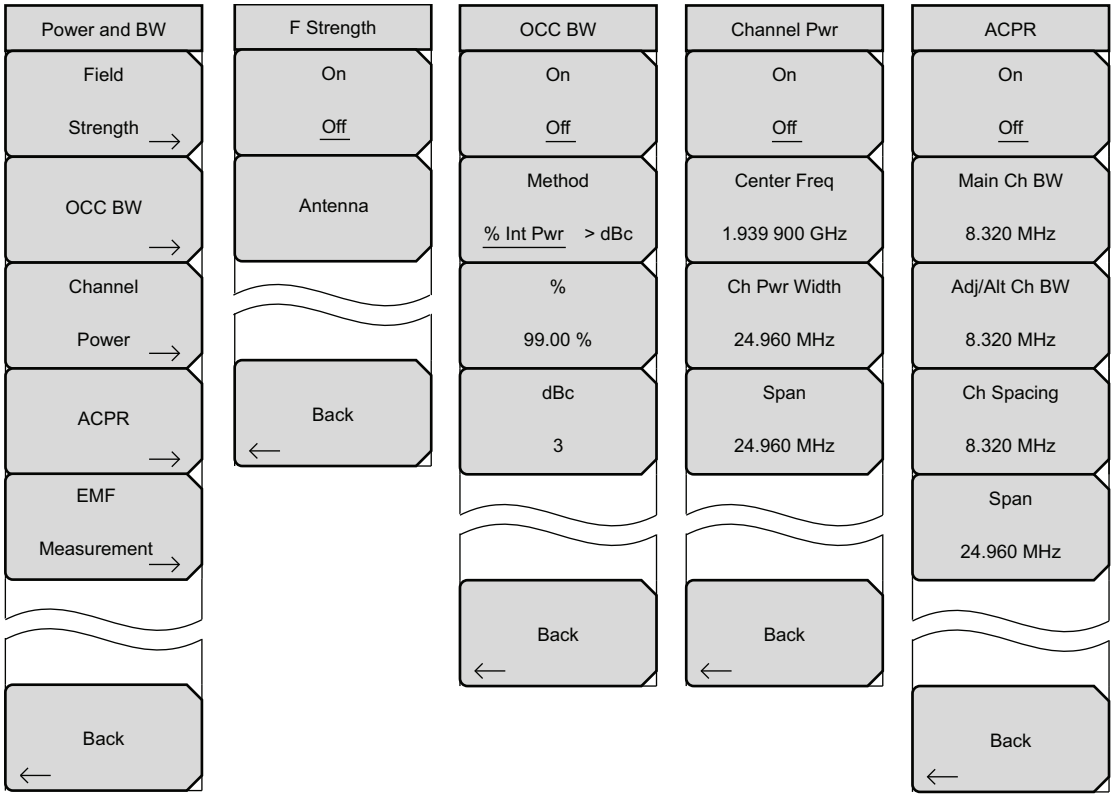


Figure 2-17. Measure Submenu Keys — Power and Bandwidth

Measure Menu (3 of 5)

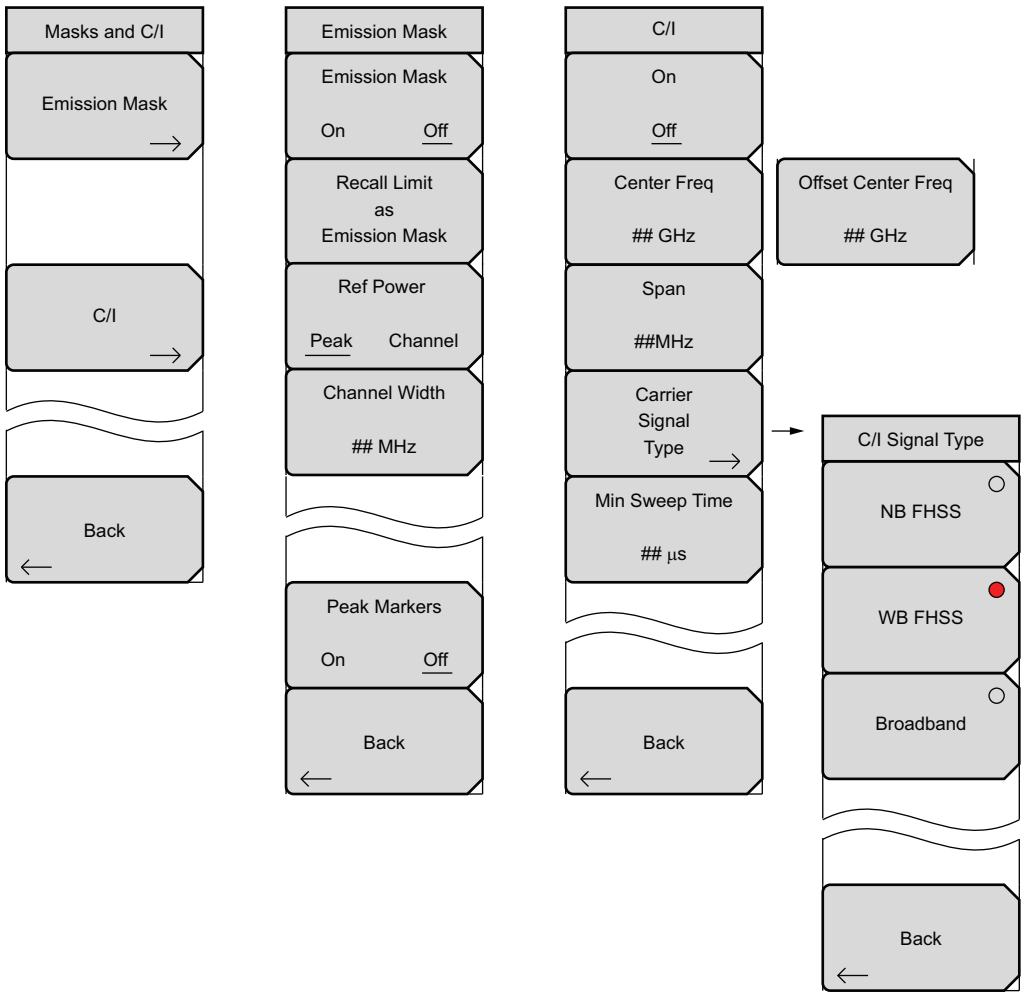


Figure 2-18. Measure Submenu Keys — Masks and C/I

Measure Menu (4 of 5)

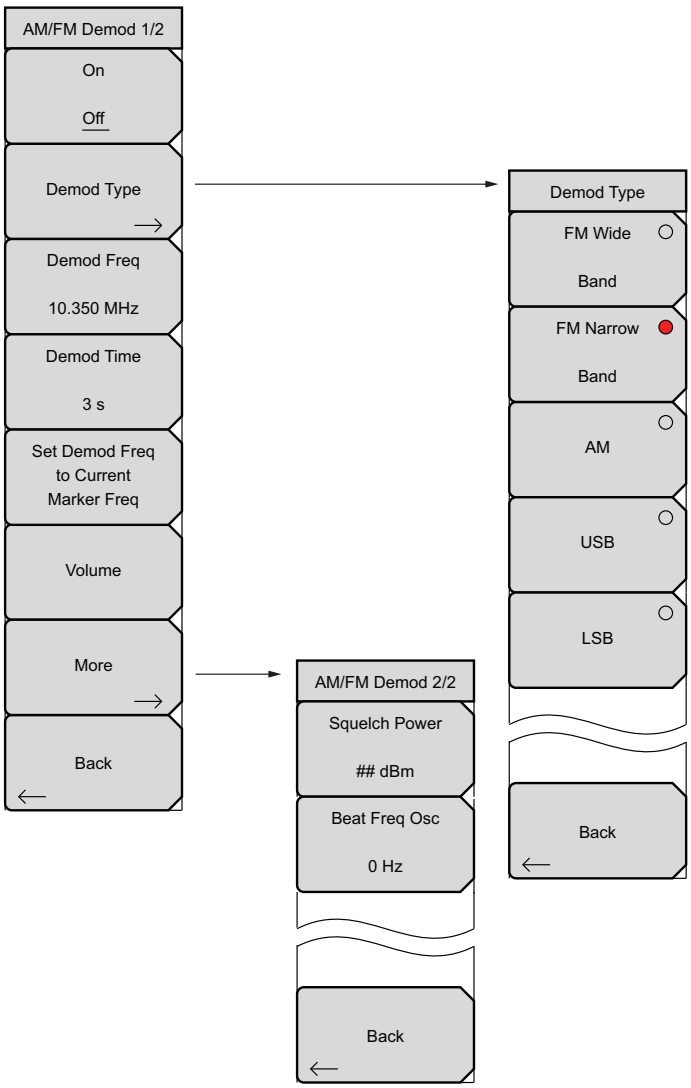


Figure 2-19. AM/FM Demod Menus

Measure Menu (5 of 5)

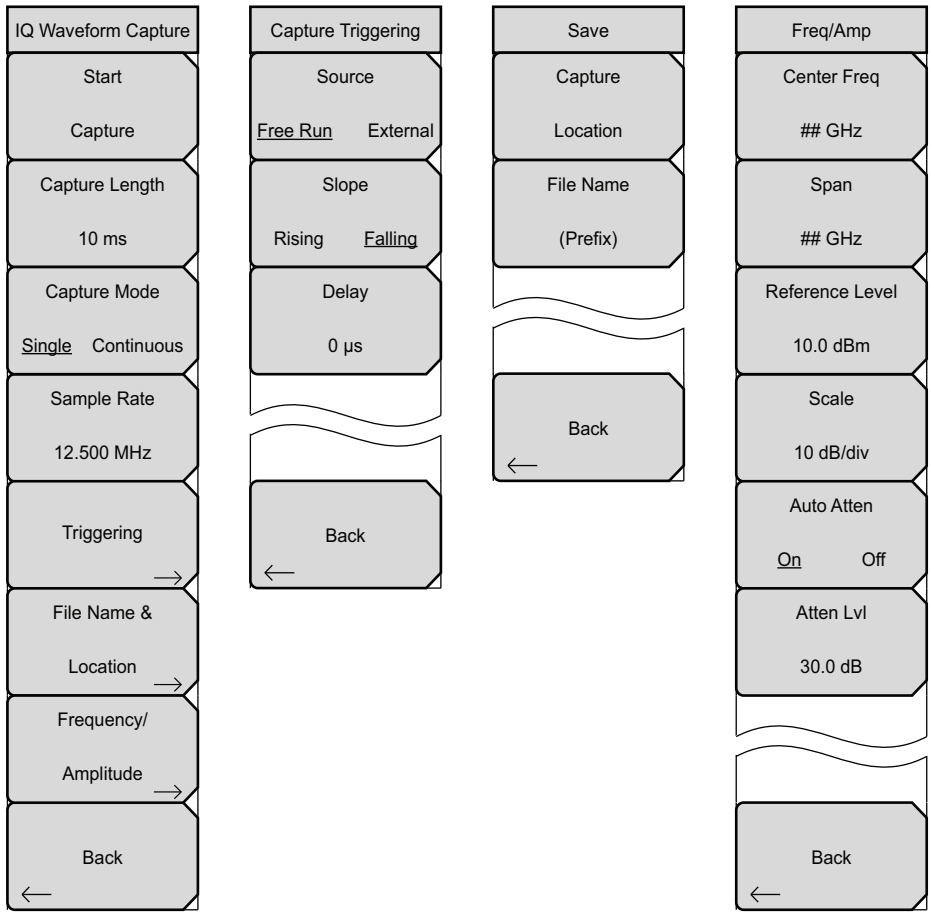


Figure 2-20. IQ Waveform Capture Submenu Keys

Sweep Menu

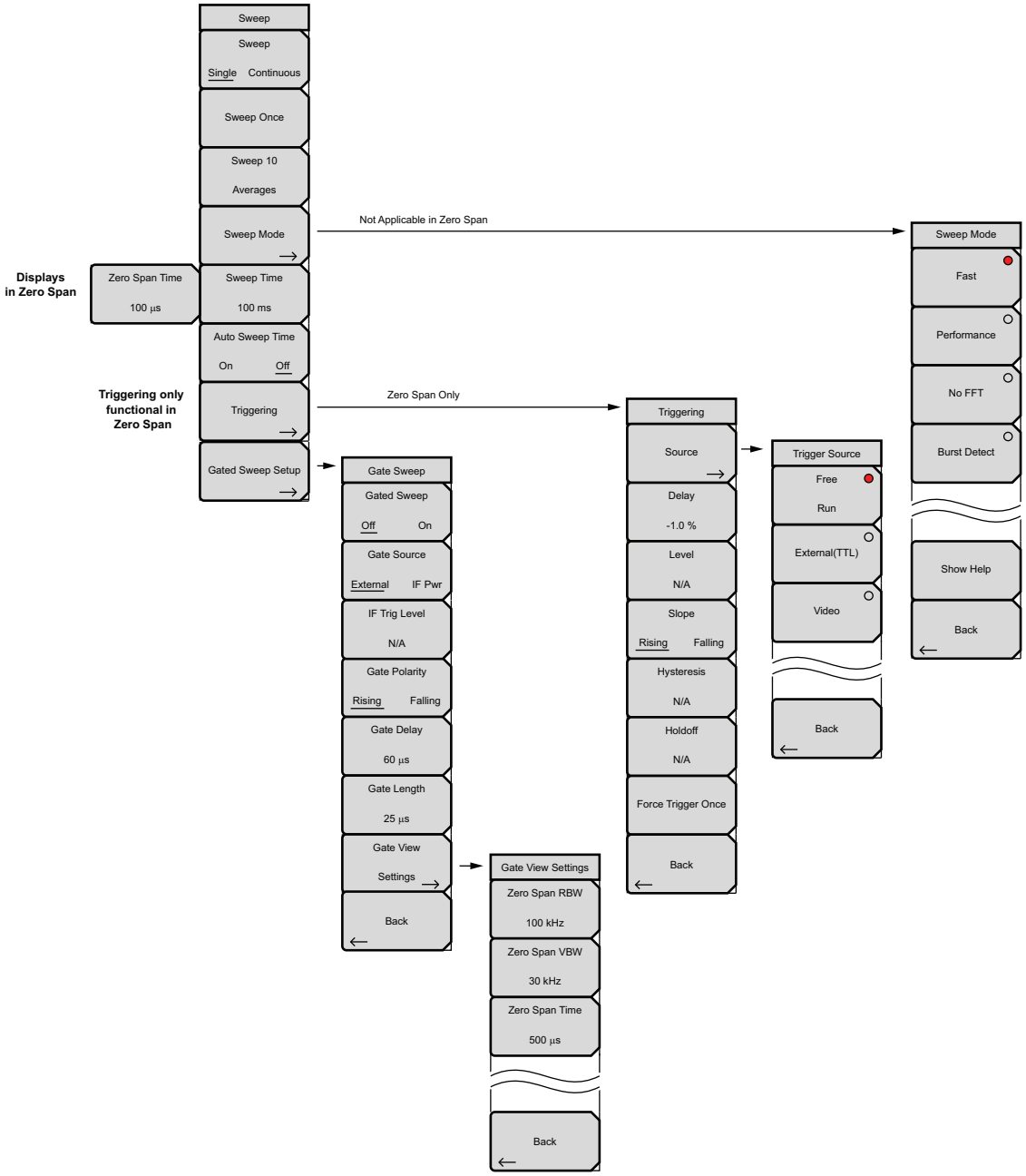


Figure 2-21. Sweep Submenu Keys

Trace Menus

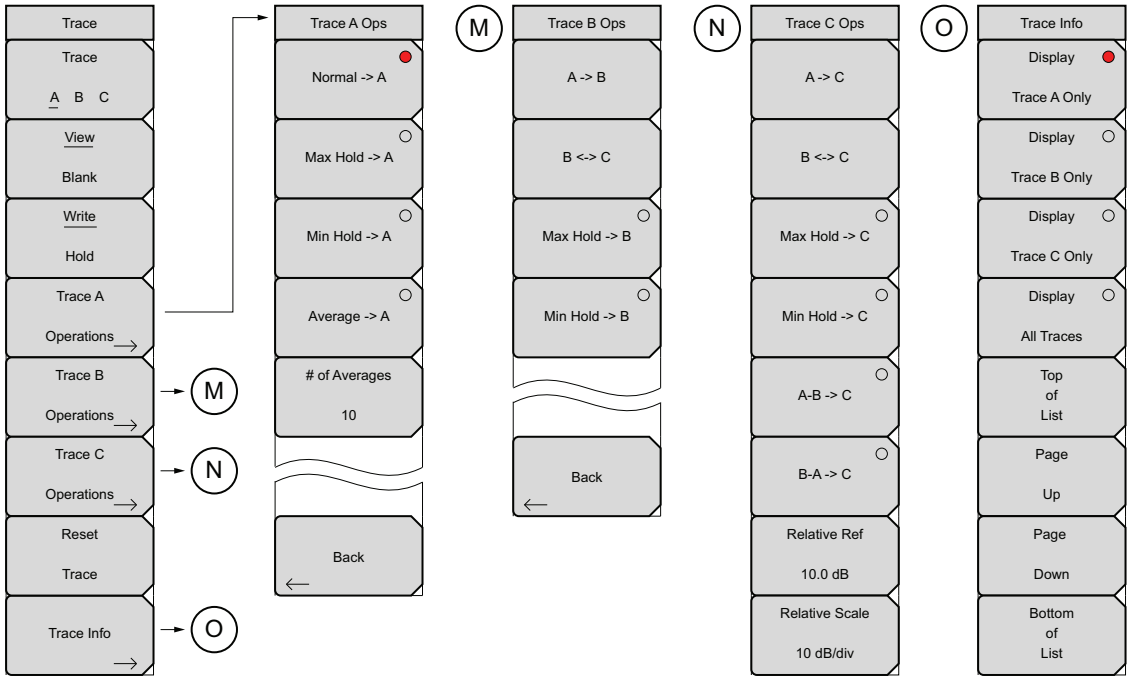


Figure 2-22. Trace Submenu Keys

Limit Menus

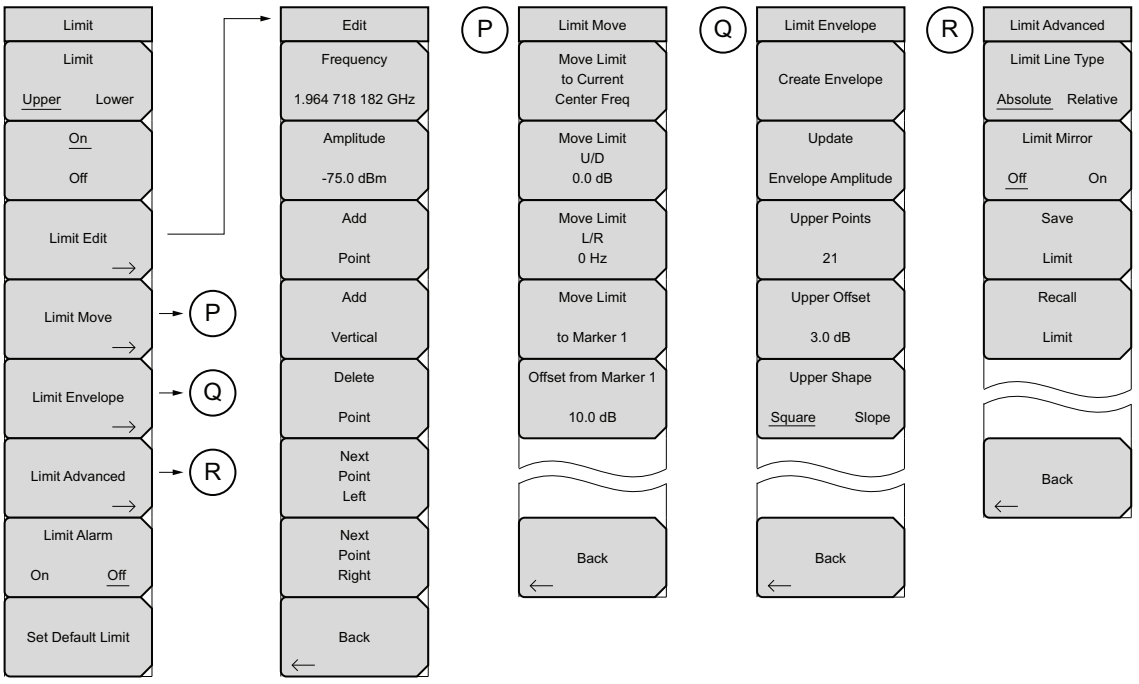


Figure 2-23. Limit Submenu Keys

Application Options Menu

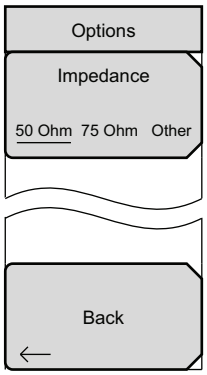
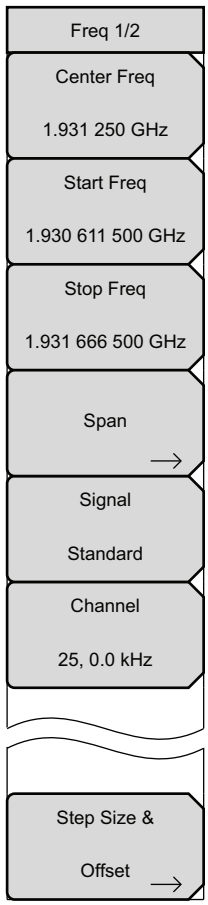


Figure 2-24. System Menu, Application Options Submenu Keys

2-25 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.



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 effect 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.

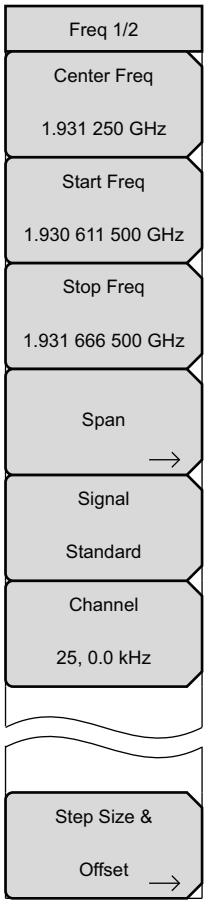
Stop Freq: Press the **Freq** main menu key followed by the Stop Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a stop frequency lower than the current start frequency is entered, the start frequency will be changed to yield a 10 Hz span.

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 2-46.

Figure 2-25. SPA Frequency Menu (1 of 2)

Freq (Frequency) Menu (Continued)



Signal Standard: Use the up or 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 or 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 2-42.

Figure 2-26. SPA Frequency Menu (2 of 2)

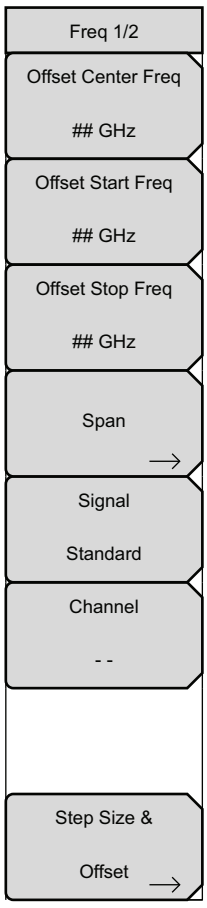
2-26 Frequency Menu (Freq 1/2) with Offset Function

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 that is displayed on the instrument from the actual swept frequency. When enabled, Offset is displayed at the bottom of the screen (Figure 2-29) and the Center Freq, Start Freq, and Stop Freq submenu keys indicate that a frequency offset is 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".



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 effect as the MHz submenu key. With zero offset, this key differs, refer to Figure 2-26.

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. Refer to "Span Menu" on page 2-46.

Signal Standard: Use the up or 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 or 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 2-42.

Figure 2-27. SPA Freq 1/2 with Offset Function Menu

Freq 2/2 Menu

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

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 or 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 or 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.

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

Freq Offset: Enter the desired offset (positive or negative) 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 **Enter** key has the same effect as the MHz submenu key.

Offset Step Size: Enter the desired frequency offset step size. The offset frequency step specifies the amount by which the offset frequency will change when the up or down arrow keys are pressed.

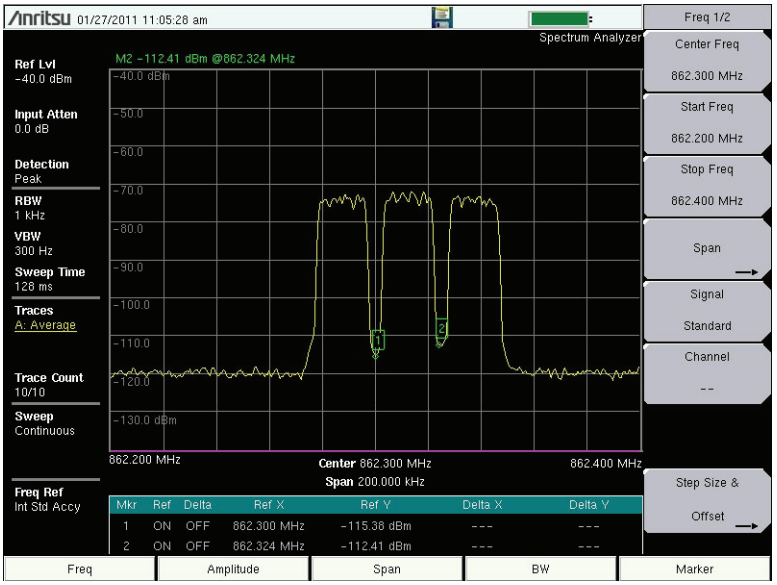
Use the keypad or the rotary knob to change the Offset Step Size.

Back: Returns to the "Frequency Menu (Freq 1/2) with Offset Function" on page 2-41.

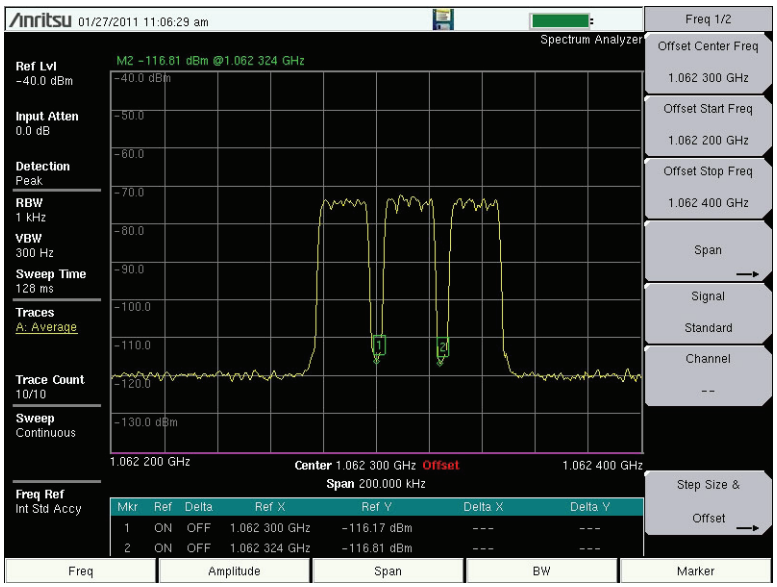
Figure 2-28. SPA Freq 2/2 Menu Offset Function

Offset Example

Example of Frequency Offset Using the Same Source Signal



No Offset

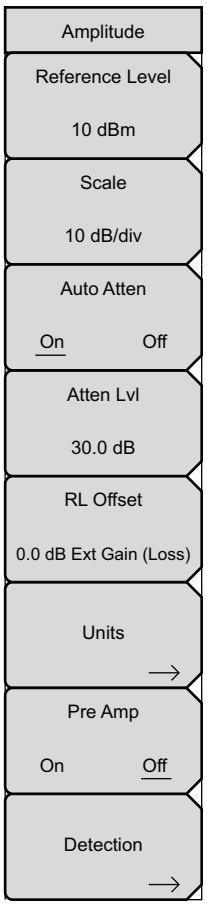


+200 MHz Frequency Offset
(**Freq** > Step Size & Offset > Freq Offset)

Figure 2-29. 200 MHz Frequency Offset Example

2-27 Amplitude Menu

Key Sequence: **Amplitude**



Reference Level: The reference level is the top grid line on the display and can be set from +30 dBm to –150 dBm. A value may be entered from the keypad, use the ± key for a minus sign. After entering the value press the dBm submenu key or the **Enter** key. The up or down arrow keys change the reference level in 10 dB steps, and the left or right 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.

Scale: 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.

Auto Atten On/Off: 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.

Atten Lvl: Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.

RL Offset xx dB Ext Gain/Loss: 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.

Units: Select the display units from this submenu key, for example:

dBm, dBV, dBmV, dBµV, Volt, dBW, A, dBA, or Watt

See Figure 2-14 on page 2-29.

Press the Back submenu key to return to the Amplitude menu.

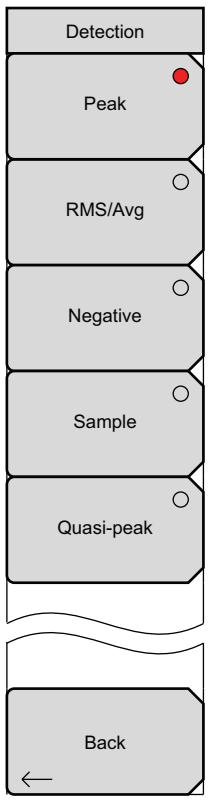
Pre Amp On/Off: This submenu key turns the low-noise front-end preamplifier on or off. To assure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be less than –40 dBm.

Detection: 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 "Detection Menu" on page 2-45.

Figure 2-30. SPA Amplitude Menu

Detection Menu

Key Sequence: **Amplitude** > Detection



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

RMS/Avg: 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(power) is displayed for the detector, as well as for VBW and trace average.

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.

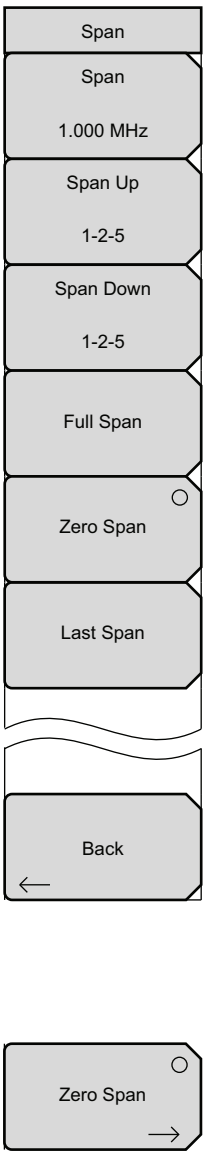
Back: Returns to the “Amplitude Menu” on page 2-44.

Figure 2-31. SPA Detection Menu

2-28 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: 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 Up 1-2-5: 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, then pressing the submenu key for the first time changes the span to 2.0 MHz, and the next press takes the value to 5.0 MHz, and so on.

Span Down 1-2-5: 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, then pressing the submenu key for the first time changes the span to 1.0 MHz, and the next press takes the value to 500 kHz, then 200 kHz, and so on.

Full Span: Pressing this button sets the span to cover the entire tunable spectrum of the unit.

Zero Span: 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, then 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 (Option 89): Press the Zero Span submenu key again (after the circle is red) to access the Zero Span IF BW menu. Zero Span IF bandwidth 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. You can select **Normal** or any one of four fixed IF bandwidths **7 MHz**, **10 MHz**, **16 MHz**, or **32 MHz**. When **Normal** is selected, the IF bandwidth is influenced by the RBW filters.

Last Span: This submenu key returns the span to the most recent span value immediately before a change was made.

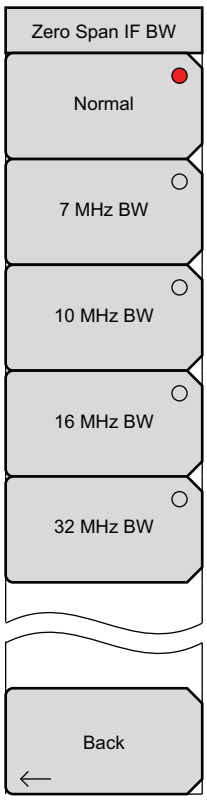
Back: Returns to the previous menu

Figure 2-32. SPA Span Menu

2-29 Zero Span IF BW Menu

Press the Span main menu key to access the Span menu. Then press the Zero Span submenu key to select Zero Span. If Option 89 is installed on your instrument, then press the Zero Span submenu key again (after the circle is red) to access the Zero Span IF BW menu. 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** > Zero Span



Normal: Press this button to select a bandwidth that uses bandpass filters in the normal RBW chain. When this button is pressed (red circle indicates active setting), the IF bandwidth is influenced by the selection of RBW filters.

7 MHz BW: Press this button to select a fixed IF bandwidth of 7 MHz.

10 MHz BW: Press this button to select a fixed IF bandwidth of 10 MHz.

16 MHz BW: Press this button to select a fixed IF bandwidth of 16 MHz.

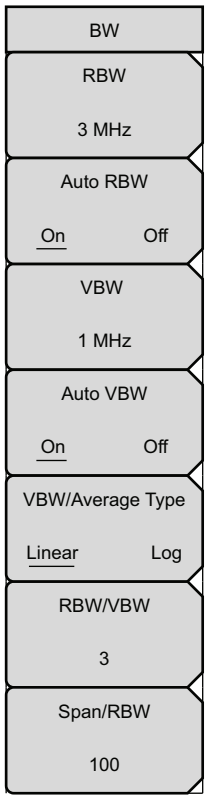
32 MHz BW: Press this button to select a fixed IF bandwidth of 32 MHz.

Back: Returns to the Span menu

Figure 2-33. Zero Span IF BW Menu

2-30 BW (Bandwidth) Menu

Key Sequence: **BW**



RBW: 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 begins at 1 Hz and increases in a 1 to 3 sequence from 1 Hz to 3 Hz to 10 Hz, from 10 Hz to 30 Hz to 100 Hz, and so on, up to 10 MHz

Auto RBW On/Off: 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: 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 On/Off: 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: Toggles between Linear averaging (arithmetic mean) and Logarithmic averaging (geometric mean).

RBW/VBW: 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.

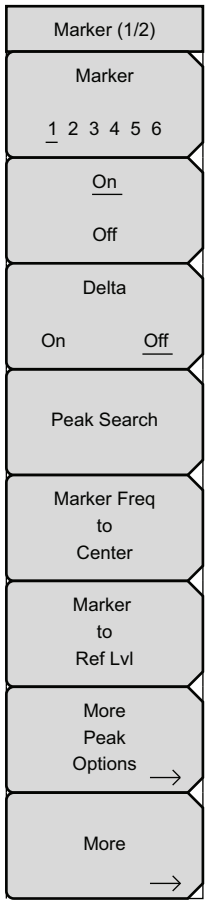
Span/RBW: This submenu key displays the ratio between the span width and the resolution bandwidth. The default value is 100, meaning that the span width is approximately 100 times the resolution bandwidth. The value is approximate because resolution bandwidth filters come in discrete steps while span 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.

Figure 2-34. SPA Bandwidth Menu

2-31 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: Press to select which marker (1, 2, 3, 4, 5, 6) is active using the touch screen. The active marker is underlined.

On/Off: Turns the selected marker underlined in the Marker submenu key On or Off.

Delta On/Off: Turns on a delta marker and prompts for a delta offset frequency, either positive or negative from the frequency of the currently active marker.

Peak Search: This key places the currently active marker on the highest signal amplitude currently displayed on screen.

Marker Freq to Center: Moves the frequency noted by the active marker to the center frequency position and center of the display.

Marker to Ref Level: Causes the amplitude of the currently active marker to become the reference level, which is the top horizontal line of the display.

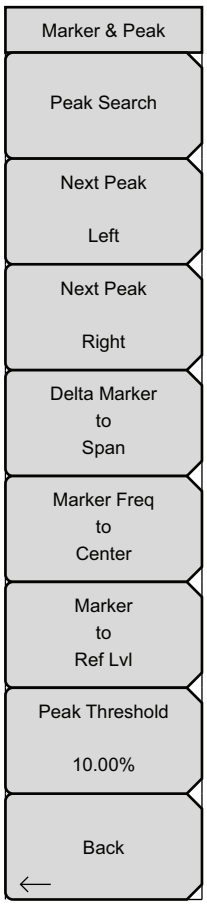
More Peak Options: Brings up a secondary menu of submenu keys for more peak searching options. See the "More Peak Options (Marker & Peak) Menu" on page 2-50.

More: Opens a submenu of additional Marker options. See the "Marker 2/2 Menu" on page 2-51.

Figure 2-35. SPA Marker (1/2) Menu

More Peak Options (Marker & Peak) Menu

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



Peak Search: Places the currently active marker on the highest amplitude signal currently on screen.

Next Peak Left: 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: 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: 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: Sets the center frequency to the frequency of the currently active marker.

Marker to Ref Lvl: Sets the reference level (top grid line) to the amplitude of the currently active marker.

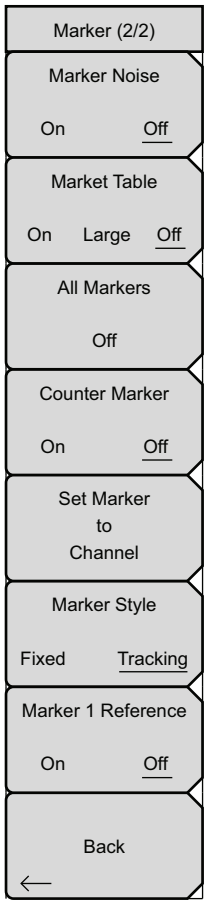
Peak Threshold: Allows the user to specify how far above the average noise floor a signal must rise before it is considered a peak.

Back: Returns to the “Marker Menu” on page 2-49.

Figure 2-36. SPA Marker & Peak Menu

Marker 2/2 Menu

Key Sequence: **Marker >** More



Marker Noise On/Off: 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/Off: 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: Turns off all markers.

Counter Marker On/Off: 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: 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.

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.

Marker Style: 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.

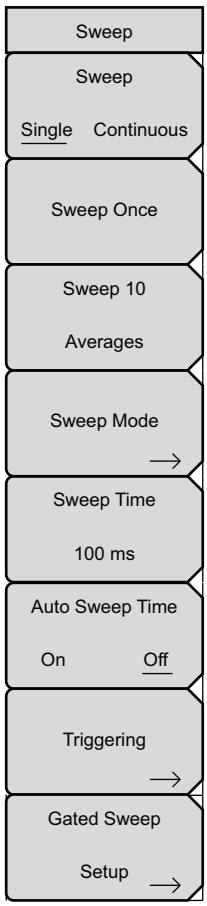
Marker 1 Reference: Selects whether Marker 1 is the reference for all six delta markers, or whether each of the six reference markers has an associated delta marker.

Back: Returns to the “Marker Menu” on page 2-49.

Figure 2-37. SPA Marker (2/2) Menu

2-32 Sweep Menu

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



Sweep Single/Continuous: This submenu key toggles between continuous sweep and single sweep. In single sweep mode, the results of a sweep are displayed on the screen while the instrument awaits a trigger event to start a new sweep.

Sweep Once: 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 # Averages: Sweeps the number of times set using the # of Averages button under the Trace A Ops menu. Trace A must be set to Averaging (**Shift** > **Trace** (**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 Mode (Available only on some models)**:** Pressing this submenu key opens the "Sweep Mode Menu" on page 2-53.

Sweep Time: Sets the sweep time for the measurement.

Auto Sweep Time: 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.

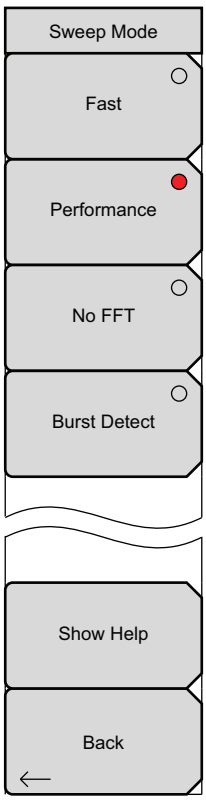
Triggering: Functional in Zero span only. Displays the "Triggering Menu" on page 2-54.

Gated Sweep Setup (Option 90 Only)**:** For configuring Gated Sweep. Opens the "Gate Setup Menu (Option 90)" on page 2-56.

Figure 2-38. SPA Sweep Menu

Sweep Mode Menu

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



This menu sets the current sweep mode. Select one of the four Sweep Mode options.

Fast: Fastest sweep speed.

Performance: Provides best amplitude accuracy and ensures all specifications are met.

No FFT: Slowest sweep speed. Ideal for analog and pulse modulated signals.

Burst Detect: Press to view narrow pulsed signals.

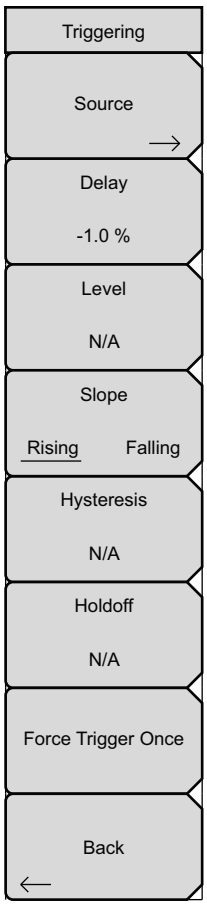
Show Help: Display a table showing the merits and tradeoffs of the four Sweep Mode settings.

Back: Returns to the "Sweep Menu" on page 2-52.

Figure 2-39. SPA Sweep Mode Menu

Triggering Menu

Key Sequence: **Shift** > **Sweep** (**3**) key > Triggering (available only with Zero Span)



Source: Displays the "Trigger Source Menu" on page 2-55.

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, µs or ms. A negative % value puts the trigger position on screen while a positive value places the trigger point off the screen to the left.

A negative delay displays the trigger point on the screen, while a positive value places the trigger point off the screen to the left.

Level: Used when External TTL, Video, or IF Power buttons are activated in the "Trigger Source Menu" on page 2-55. Sets a trigger level 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 reaches at least 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, 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.

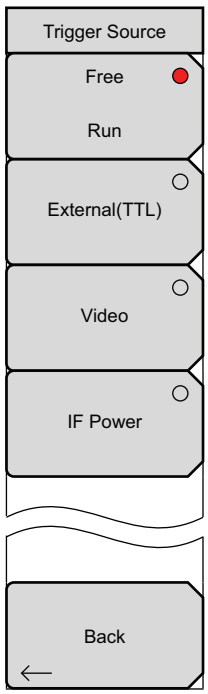
Force Trigger Once: Forces a sweep regardless of meeting any trigger criteria.

Back: Returns to the "Sweep Menu" on page 2-52.

Figure 2-40. SPA Triggering Menu

Trigger Source Menu

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



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): 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.

Video: This mode is used in zero span to use Video power as the trigger source. The power level can be set (using the submenu key for "Level" on page 2-54) 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, then no trace will be on the screen.

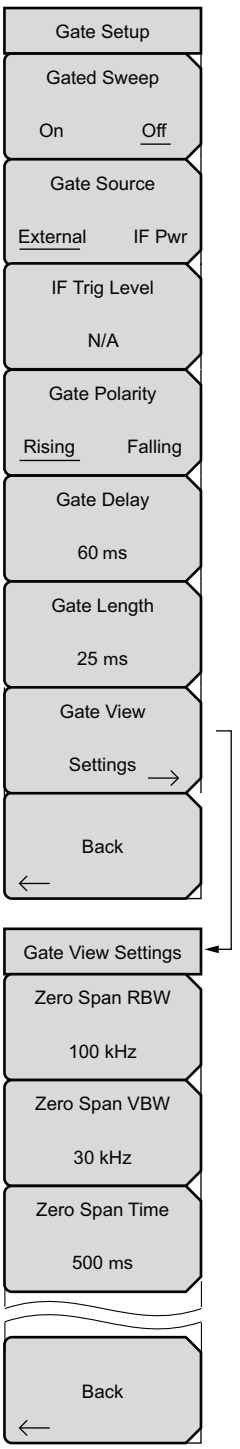
IF Power (not available on all instruments: This mode is used in zero span to use IF power level as the trigger source. The power level can be set (using the submenu key for "Level" on page 2-54) from –130 dBm to +30 dBm, using the rotary knob, arrow keys, or keypad. The trigger is based on the measured signal level. If no signal reaches or exceeds the trigger level, then no trace will be on the screen.

Back: Returns to the "Triggering Menu" on page 2-54.

Figure 2-41. SPA Triggering Menu

Gate Setup Menu (Option 90)

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



Gated Sweep: Turns the Gated Sweep function On and Off.

Gate Source
External IF Pwr: Toggles the Gate Source between an external trigger signal that can be input using the instrument's Ext Trigger In connector and the IF Pwr level.

IF Trig Level: Sets the trigger power level for IF power when Gate Source is set to IF Pwr.

Gate Polarity Rising/Falling: Press to select the desired edge trigger to begin the gated sweep.

Gate Delay: Sets the start of the gated sweep indicated by the left border of the blue dashed rectangle shown in the bottom graph of Figure 2-3 on page 2-8.

Gate Length: Sets the length of the gate and is reflected on the zero span graph by the width of the blue rectangle as shown in Figure 2-3.

Gate View Settings: 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).

Zero Span RBW: Sets the resolution bandwidth of the zero span graph.

Zero Span VBW: Sets the video bandwidth of the zero span graph.

Zero Span Time: Sets the sweep time of the zero span graph.

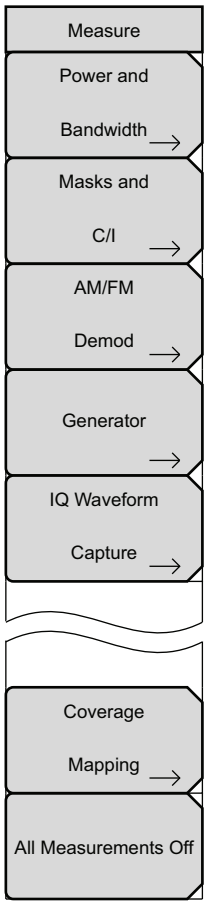
Back: Returns to the Gate Setup menu.

Back: Returns to the "Sweep Menu" on page 2-52 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.

Figure 2-42. SPA Gated Sweep Menu

2-33 Measure Menu

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



Power and Bandwidth: Opens the "Power and BW Menu" on page 2-58.

Masks and C/I: Opens the "Masks and C/I Menu" on page 2-63.

AM/FM Demod: Opens the "AM/FM Demod 1/2 Menu" on page 2-67.

Generator: Opens the "Generator Menu" on page 2-70. This submenu key and the Generator menu are available only in spectrum analyzers with a Tracking Generator option.

IQ Waveform Capture: This submenu key is displayed only when Option 24 in installed. Opens the "IQ Waveform Capture Menu (Option 24)" on page 2-71.

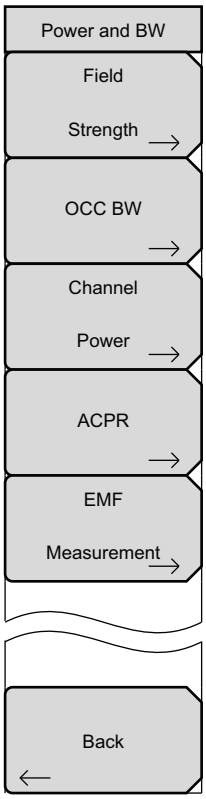
Coverage Mapping: Opens the "Coverage Mapping Menu (Option 431)" on page 2-74.

All Measurement Off: Turns off any active measurements.

Figure 2-43. SPA Measure Menu

Power and BW Menu

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



Field Strength: Opens the "Field Strength Menu" on page 2-59.

OCC BW: Opens the "OCC BW Menu" on page 2-59.

Channel Power: Opens the "Channel Power Menu" on page 2-60.

ACPR: Opens the "ACPR Menu" on page 2-61.

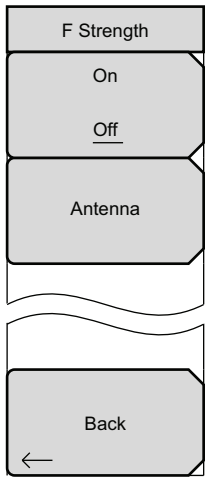
EMF Measurement: Opens the "EMF Menu (Option 444)" on page 2-62.

Back: Returns to the "Measure Menu" on page 2-57.

Figure 2-44. Power and BW Menu

Field Strength Menu

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



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

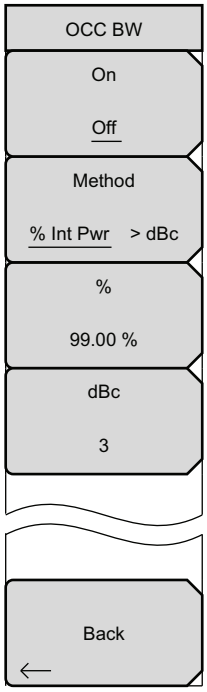
Antenna: This submenu key brings up a dialog box that lists all the antennas for which the instrument has data, including both standard antennas and custom antennas that have been added using Master Software Tools. Antenna frequency information is also displayed. Use the up or down arrow keys or the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

Back: Returns to the "Power and BW Menu" on page 2-58.

Figure 2-45. SPA Field Strength Menu

OCC BW Menu

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



On/Off: This submenu key turns the Occupied Bandwidth on or off.

Method: Select either the % of Internal Power (default) or dB Down measurement method as displayed in the message area.

%: Use the keypad, the directional arrow keys, or the rotary knob to enter the percent of power, from 0% to 99%.

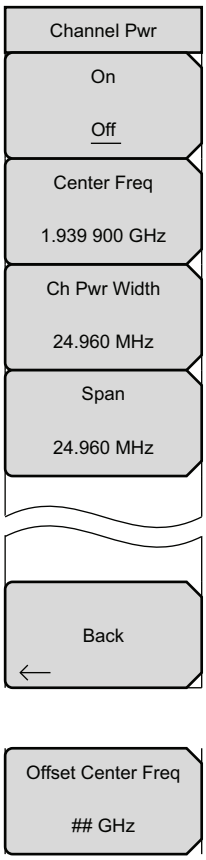
dBc: Use the keypad, the directional arrow keys, or the rotary knob to enter the dBc value (0 dBc to 100 dBc).

Back: Returns to the "Power and BW Menu" on page 2-58.

Figure 2-46. SPA OCC BW Menu

Channel Power Menu

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



On/Off: 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 **Shift** and the **Sweep** keys and pressing the Detection submenu key.

Center Freq: Activates the center frequency function, and allows setting the center frequency of the instrument for the channel power measurement. Use the **Arrow** keys or the rotary knob, then press **Enter**. The up or down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu". The left or right arrows change the frequency by 10% of the span. Or use the number keypad, then press a unit key or press **Enter** for values in MHz. With zero offset, this key displays the title **Center Freq**. With an offset other than zero, this key displays the title **Offset Center Freq**, as shown below the full menu. Refer to Section 2-26 "Frequency Menu (Freq 1/2) with Offset Function" on page 2-41.

Ch Pwr Width: 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 up or down arrow keys change the Channel Power Width by the frequency step value. The left or right arrow keys change the value by 10% of the span.

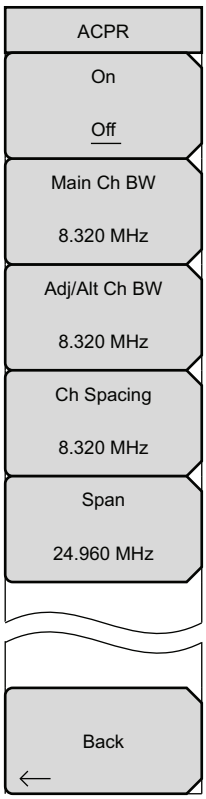
Span: Sets the span for channel power measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.

Back: Returns to the "Power and BW Menu" on page 2-58.

Figure 2-47. SPA Channel Power Menu

ACPR Menu

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



On/Off: Begins or ends the ACPR measurement.

Main Ch BW: 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.

Adj/Alt Ch BW: 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.

Ch Spacing: 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 up or down arrows change the frequency by the frequency step size entered in the “Freq (Frequency) Menu” on page 2-39. The left or right arrow keys change the value by 10% of the span.

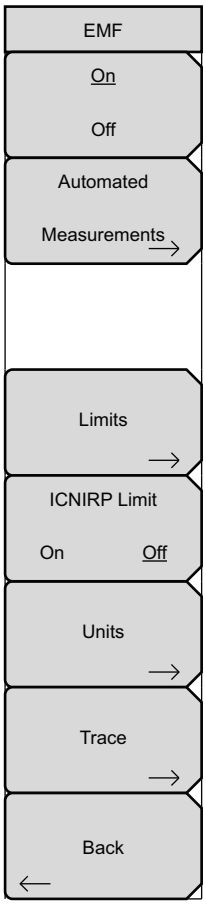
Span: Sets the span for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.

Back: Returns to the “Power and BW Menu” on page 2-58.

Figure 2-48. SPA ACPR Menu

EMF Menu (Option 444)

Key Sequence: **Shift** > **Measure** (**4**) key > Power and Bandwidth > EMF Measurement



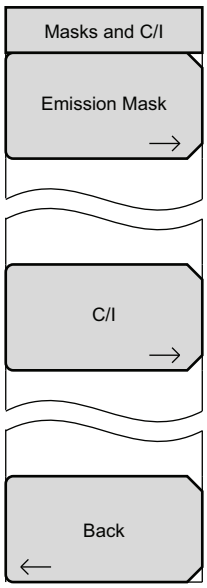
EMF
On Off: Turns EMF Measurement On and Off. Refer to Chapter 9, "EMF (Option 444)".

Back: Returns to the "Power and BW Menu" on page 2-58.

Figure 2-49. EMF Menu

Masks and C/I Menu

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



Emission Mask: Opens the "Emission Mask Menu" on page 2-64.

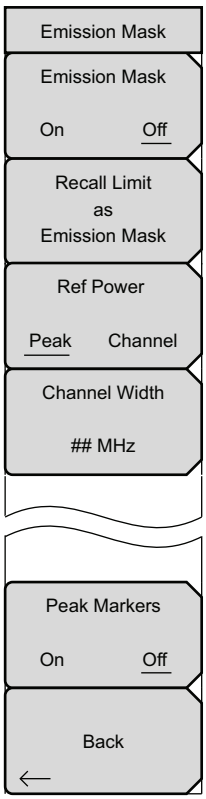
C/I: Opens the "C/I Menu" on page 2-65.

Back: Returns to the "Measure Menu" on page 2-57.

Figure 2-50. Masks and C/I Menu

Emission Mask Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Masks and C/I > Emission Mask



This submenu controls the setup and display of the emission mask. The emission mask is an upper segmented limit line. It must have more than two nodes, which mean at least two segments. 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.

Note: Before turning Emission Mask on, you must have created or recalled a limit line.

Recall Limit as Emission Mask: Opens the recall menu for selecting 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 preset within the Signal Standard. Use this button to adjust the width as desired.

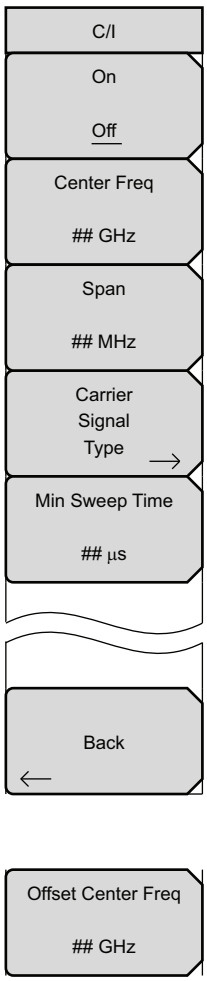
Peak Markers On/Off: Turning on this feature displays a peak marker within an Emission Mask segment. For example, if the Emission Mask had seven segments then there would be seven peak markers.

Back: Returns to the "Masks and C/I Menu" on page 2-63.

Figure 2-51. Emission Mask Menu

C/I Menu

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



On/Off: Turns carrier to interference ratio measurements on or off.

Center Freq: Press this submenu key to set the center frequency or the offset center frequency. Use the **Arrow** keys or the rotary knob, then press **Enter**. Or use the number keypad, then press a unit key or press **Enter** for values in MHz. With zero offset, this key displays the title **Center Freq**. With an offset other than zero, this key displays the title **Offset Center Freq**, as shown below the full menu. Refer to Section 2-26 “Frequency Menu (Freq 1/2) with Offset Function” on page 2-41.

Span: Press this submenu key to set the frequency span. Use the **Arrow** keys or the rotary knob, then press **Enter**. Or use the number keypad, then press a unit key or press **Enter** for values in MHz.

Carrier Signal Type: Press this submenu key to display the “C/I Signal Type Menu” on page 2-66.

Min Sweep Time: Press this submenu key to set the sweep time. The minimum valid sweep time is displayed on the key. (The minimum valid sweep time is dependent on other settings, such as RBW and VBW.) Use the **Arrow** keys or the rotary knob, then press **Enter**. Or use the number keypad, then press a unit key or press **Enter** for values in µs.

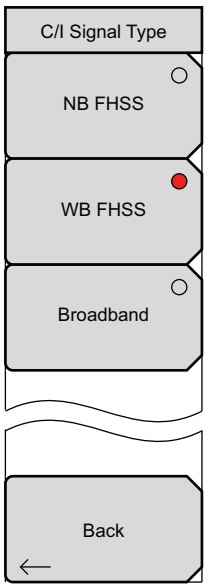
Back: Returns to the “Masks and C/I Menu” on page 2-63.

Offset Center Freq: Submenu key label when a frequency offset has been entered.

Figure 2-52. C/I Menu

C/I Signal Type Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Masks and C/I > C/I > Carrier Signal Type



After you select a signal type, by pressing a submenu key, the "C/I Menu" on page 2-65 is automatically displayed. This is the default behavior even if you press the active key (with the red circle displayed).

NB FHSS: Press this submenu key to set Narrowband Frequency Hopping Spread Spectrum as the interfering signal type.

WB FHSS: Press this submenu key to set Wideband Frequency Hopping Spread Spectrum as the interfering signal type.

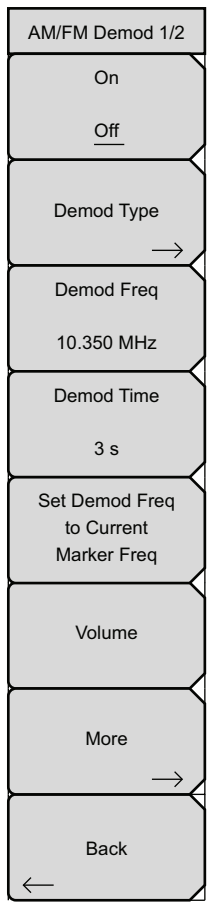
Broadband: Press this submenu key to set Broadband (such as CDMA or GSM) as the interfering signal type.

Back: Returns to the "C/I Menu" on page 2-65. without changing the currently-selected signal type.

Figure 2-53. C/I Signal Type Menu

AM/FM Demod 1/2 Menu

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



On/Off: Turns AM/FM Demodulation on or off.

Demod Type: Provides submenu keys to select the type of signal to be demodulated (refer to "Demod Type (AM/FM) Menu" on page 2-68):

FM Wide Band
FM Narrow Band
AM
USB
LSB

Demod Freq: 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.

Demod Time: Use the keypad, the directional arrow keys, or the rotary knob to increase or decrease the demodulation time, and press the **Enter** key to select. The demodulation time can be set from 100 milliseconds to 500 seconds. The instrument sweeps one time for every demodulation period. Sweeping pauses during the demodulation time.

Set Demod Freq to Current Marker Freq: Sets the demodulation frequency to the frequency of the current marker.

Volume: The current volume setting is displayed on the screen. Use the up or down arrow keys or rotary knob to change the volume, and press the **Enter** key to select.

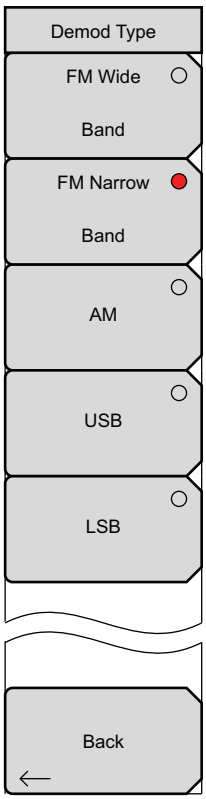
More: Press this submenu key to display the "AM/FM Demod 2/2 (More) Menu" on page 2-69.

Back: Returns to the "Measure Menu" on page 2-57.

Figure 2-54. SPA AM/FM Demod 1/2 Menu

Demod Type (AM/FM) Menu

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



Press one of these submenu keys to select an AM/FM demodulation type. The red circle indicates the active selection.

FM Wide Band: Frequency Modulation

FM Narrow Band: Frequency Modulation

AM: Amplitude Modulation

USB: Upper Sideband. This can also be used when demodulating CW (Morse code) signals.

LSB: Lower Sideband. This can also be used when demodulating CW (Morse code) signals.

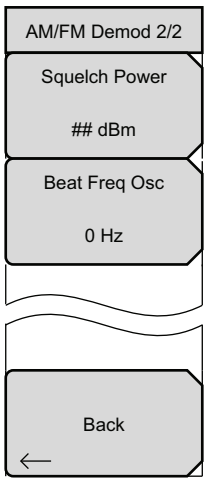
Back: Returns to the "AM/FM Demod 1/2 Menu" on page 2-67.

Figure 2-55. SPA AM/FM Demod Menu

Refer to Section 2-19 "AM/FM/SSB Demodulation" on page 2-22 for a description of the built-in demodulator.

AM/FM Demod 2/2 (More) Menu

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



Squelch Power: Sets the squelch power value. Use this setting to limit noise when there is no signal to demodulate. The squelch value is the limit below which no signal is displayed.

Beat Freq Osc: Sets the beat frequency of the oscillator to exactly set the demodulation frequency of USB and LSB signals. Displayed only when USB or LSB is selected as the Demod Type. This can also be used when demodulating CW (Morse code) signals.

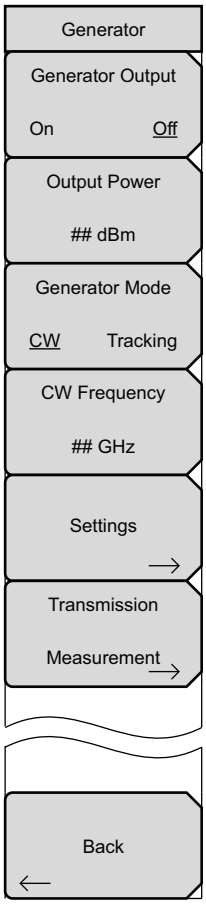
Back: Returns to the "AM/FM Demod 1/2 Menu" on page 2-67.

Figure 2-56. SPA AM/FM Demod 2/2 Menu

Generator Menu

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

This menu is available only in spectrum analyzers with a Tracking Generator option.



Generator Output
On Off: Turns the Tracking Generator Option on and off.

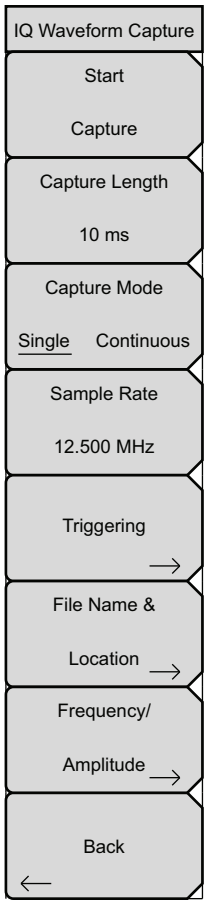
For more information about the Tracking Generator, refer to the Tracking Generator Measurement Guide, Anritsu part number 10580-00339.

Back: Returns to the "Measure Menu" on page 2-57.

Figure 2-57. SPA Generator Menu

IQ Waveform Capture Menu (Option 24)

Key Sequence: **Shift** > **Measure** (**4**) key > IQ Waveform Capture



Start Capture: Initiates a capture using the current settings. Messages will appear on screen to notify the user of progress and the filename of the data acquired after the waveform capture is complete (Figure 2-13). If Capture Mode is set to Continuous, this button becomes the Stop Capture button. Press the Stop Capture button to end a continuous waveform capture.

Capture Length: Sets the time length of the capture.

Capture Mode: When set to "single", the unit will perform 1 waveform capture each time "Start Capture" is pressed. When set to "continuous", the instrument will begin a new capture as soon as the previous one is finished.

Sample Rate: Opens the Select Capture Sample Rate dialog (Figure 2-12). Select the desired Sample Rate (MHz) and associated Bandwidth (MHz) and then press **Enter**.

Triggering: Opens the "IQ Capture Triggering Menu" on page 2-72 to set the triggering parameters.

File Name & Location: Opens the "IQ Capture Save Menu" on page 2-72 to set the directory location of the saved file and the prefix of the file name.

Frequency/Amplitude: Opens the "IQ Capture Frequency/Amplitude Menu" on page 2-73 which contains the specific buttons for setting up the capture waveform frequency, display and attenuation parameters.

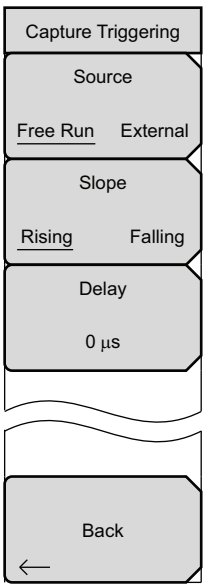
Back: Returns to the "Measure Menu" on page 2-57.

Figure 2-58. SPA IQ Waveform Capture Menu

This menu and its submenu key within the Measure menu are displayed only when Option 24 is installed on your instrument.

IQ Capture Triggering Menu

Key Sequence: **Shift** > **Measure** (**4**) key > IQ Waveform Capture > Triggering



Source: Press this submenu key to set the desired type of triggering.

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 after the set delay. After the sweep is complete, the resultant trace is displayed until the next trigger signal arrives.

Slope: Sets the trigger slope to rising or falling.

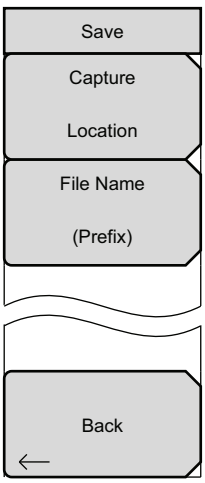
Delay: Used when External is selected for the Source. Capture begins after set time delay, once the trigger has occurred. The delay can be entered either as a percentage of the sweep time or as an absolute time delay with units of ns, µs, or ms.

Back: Returns to the "IQ Waveform Capture Menu (Option 24)" on page 2-71.

Figure 2-59. SPA IQ Capture Triggering Menu

IQ Capture Save Menu

Key Sequence: **Shift** > **Measure** (**4**) key > IQ Waveform Capture > File Name & Location



Capture Location: Opens the Select Save Location dialog and Save Location menu. Refer to the instrument's User Guide, under File Menu Overview in section Save Location menu for additional information.

Filename (Prefix): Allows changing the prefix of the output file. Files are saved with a running counter appended to this prefix. Its extension is `*.wcap`. For example: CaptureOut0045.wcap. CaptureOut is the set prefix file name, and 0045 is the counter number appended to the prefix.

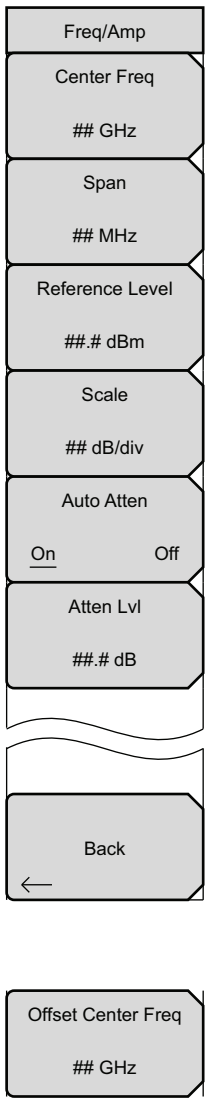
Pressing File Name (Prefix) opens the Edit Filename Prefix dialog and Save menu. The waveform capture output file is a combination of XML and binary data. The beginning of the file contains all of the capture-related parameters such as center frequency, bandwidth, and capture rate as well as any contextual information about the file, such as time, date, and GPS location (if available). At the bottom of the file, in between the <Data> tags, is the raw I and Q data in binary form. I and Q data points are each 3 bytes long and stored in 24-bit twos complement in an alternating fashion (in other words, I0, Q0, I1, Q1…).

Back: Returns to the "IQ Waveform Capture Menu (Option 24)" on page 2-71.

Figure 2-60. SPA IQ Capture Save Menu

IQ Capture Frequency/Amplitude Menu

Key Sequence: **Shift** > **Measure** (**4**) key > IQ Waveform Capture > Frequency/Amplitude



Center Freq: Press this 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 effect as the MHz submenu key. With zero offset, this key displays the title **Center Freq**. With an offset other than zero, this key displays the title **Offset Center Freq**, as shown below the full menu. Refer to Section 2-26 “Frequency Menu (Freq 1/2) with Offset Function” on page 2-41.

Span: Lets you set the frequency span to be displayed on the instrument. 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.

Reference Level: The reference level is the top grid line on the display and can be set from +30 dBm to –150 dBm. A value may be entered from the keypad, use the ± key for a minus sign. After entering the value press the dBm submenu key or the **Enter** key. The up or down arrow keys change the reference level in 10 dB steps, and the left or right 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.

Scale: The y-axis 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.

Auto Atten: 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.

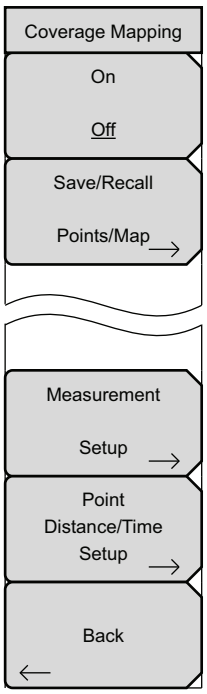
Atten Level: Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.

Back: Returns to the “IQ Waveform Capture Menu (Option 24)” on page 2-71.

Figure 2-61. SPA IQ Capture Freq/Amp Menu

Coverage Mapping Menu (Option 431)

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



Coverage Mapping
On Off: Turns Coverage Mapping on and off. Refer to Chapter 6, "Coverage Mapping".

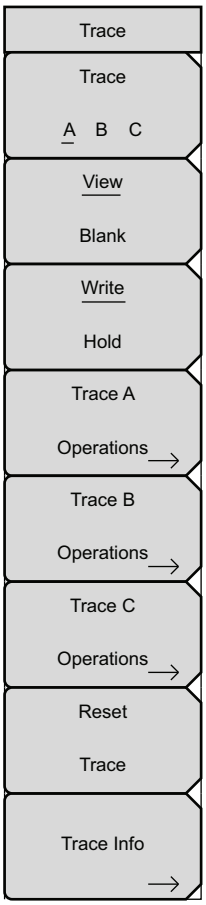
Back: Returns to the "Measure Menu" on page 2-57.

Figure 2-62. Coverage Mapping Menu

2-34 Trace Menu

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

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
A B C: 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.

View/Blank: Displays or hides the active trace.

Write/Hold: 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.

Trace A Operations: Lists the Trace A Ops menu to select an operation that can be applied to Trace A. See "Trace A Ops Menu" on page 2-76.

Trace B Operations: Lists the Trace B Ops menu to select an operation that can be applied to Trace B. See "Trace B Ops Menu" on page 2-77.

Trace C Operations: Lists the Trace C Ops menu to select an operation that can be applied to Trace C. See "Trace C Ops Menu" on page 2-78.

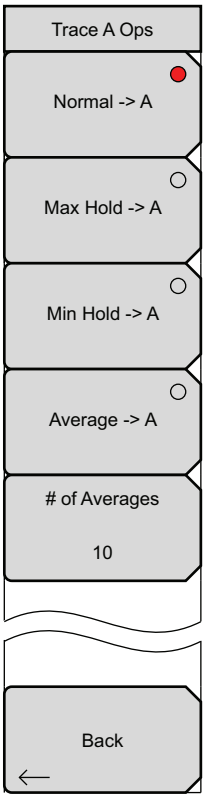
Reset Trace: Resets the trace averaging, Max Hold or Min Hold, and restarts the sweep.

Trace Info: Stops the current trace and displays a summary table of trace parameters and current settings. Press **Enter** or **Escape** to clear the table from the display and restart the trace.

Figure 2-63. SPA 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.

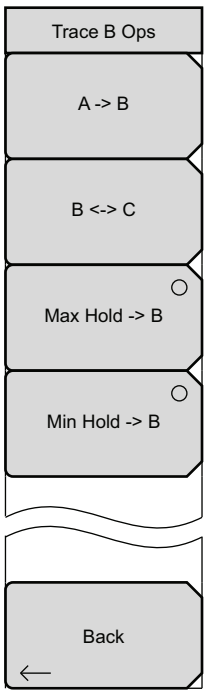
# of Averages: Sets the number of traces for use in calculating the average display value. Then number used for averaging ranges from 1 to 65535.

Back: Returns to the "Trace Menu" on page 2-75.

Figure 2-64. SPA Trace A Ops Menu

Trace B Ops Menu

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



A -> B: Copies the contents of Trace A into Trace B. Doing so overwrites the previous contents of Trace B.

B <--> C: Swaps the contents of Traces B and C.

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

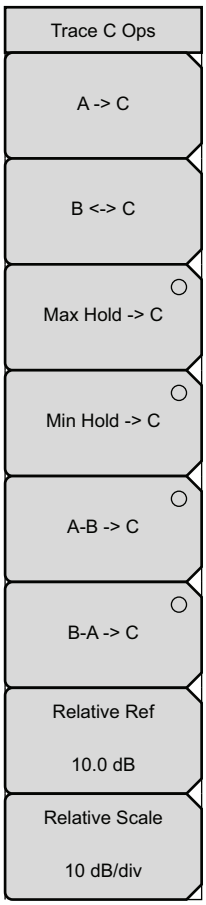
Min Hold -> B: Shows the cumulative minimum value of each display point over many trace sweeps.

Back: Returns to the "Trace Menu" on page 2-75.

Figure 2-65. SPA Trace B Ops Menu

Trace C Ops Menu

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



A -> C: Copies the contents of Trace A into Trace C. Doing so overwrites the previous contents of Trace C.

B <--> C: Swaps the contents of Trace B and Trace C.

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

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

A - B -> C: 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.

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 Trace A and Trace B.

B - A -> C: 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 Trace A and Trace B.

Relative Ref: Sets the value applied to the top grid line 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, up or down arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the **Enter** key. This entry is valid only when trace math is active.

Relative Scale: 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, up or down arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the **Enter** key. This entry is valid only when trace math is active.

Back: Returns to the "Trace Menu" on page 2-75.

Figure 2-66. SPA Trace C Ops Menu

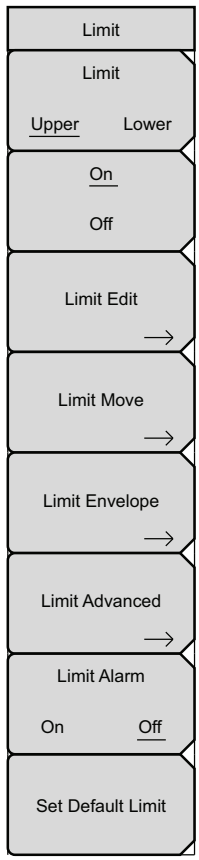
2-35 Limit Menu

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 by using the limit alarm (Figure 2-67). 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. For details, see the User Guide for your instrument.

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



Limit: 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.

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

Limit Edit: This submenu key displays the "Edit Menu (Limit)" on page 2-80 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: Press this submenu key to display the "Limit Move Menu" on page 2-82.

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 2-72 for an example limit envelope. Press this submenu key to open the "Limit Envelope Menu" on page 2-83.

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 2-85.

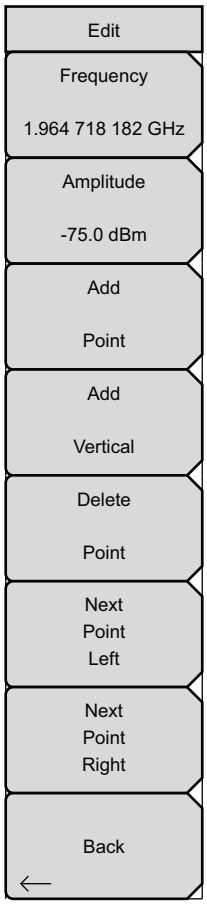
Limit Alarm On/Off: Pressing this submenu key toggles the alarm function ON and OFF for the currently active limit line. When ON, an alarm beep will occur when a data point exceeds the limit.

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 2-67. SPA Limit Menu

Edit Menu (Limit)

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



Frequency: 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 left or right arrow keys, or the rotary knob to change the frequency of an inflection point. The left or right arrows move the inflection point by 5% of the span.

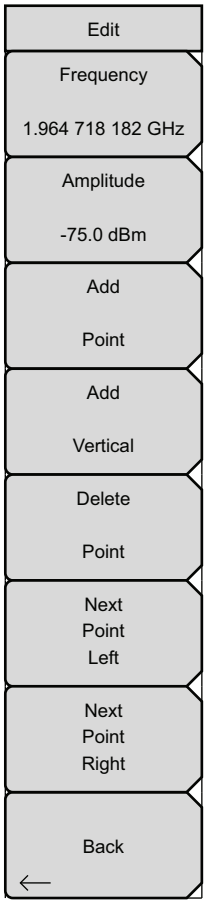
Amplitude: Press this submenu key to set the amplitude of a limit line inflection point. The amplitude of each inflection point can also be individually set. By default, when a new point is added, it takes on the amplitude that is on the limit line at the frequency where the point was added. Use the keypad (using the ± key to set a negative value), the up or down 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 up or down arrows move the amplitude by 5% of the screen height.

Add Point: 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 –30 dBm, and if the next point is 3.0 GHz with an amplitude of –50 dBm, then the added point will be at 2.5 GHz with an amplitude of –40 dBm. The frequency and amplitude values of the new point can be adjusted as needed with the Frequency and Amplitude submenu keys.

If the last limit point is active (assuming it is not at the right edge of the display), 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.

Figure 2-68. SPA Limit Edit Menu (1 of 2)

Edit Menu (Continued)



Add Vertical: 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.

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.

Delete Point: 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.

Next Point Left: 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.

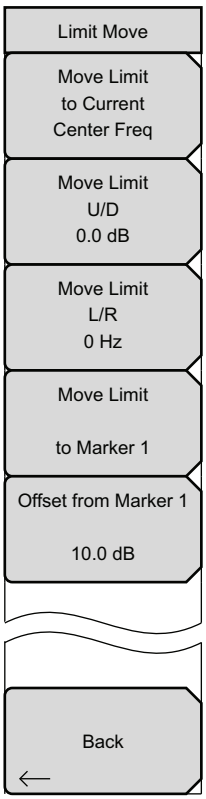
Next Point Right: Press this submenu key to select the limit point immediately to the right of the active point, making this newly selected point active for editing or deletion. With each key press, the active point becomes that point to the right of the previously active point, until the newly selected active point becomes the right-most point on the screen.

Back: Press this submenu key to return to the “Limit Menu” on page 2-79.

Figure 2-69. SPA Limit Edit Menu (2 of 2)

Limit Move Menu

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



Move Limit to Current Center Freq: 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 U/D ## dB: 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 up or down arrows move the limit line by 5% of the screen height. The left or right 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 ## Hz: 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 left or right arrows move the limit line by 5% of the span while the up or down arrows move the line by one display pixel.

Move Limit to Marker 1: 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).

Offset from Marker 1 ## dB: 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: Press this submenu key to return to the “Limit Menu” on page 2-79.

Figure 2-70. SPA Limit Move Menu

Limit Envelope Menu

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

Create Envelope: 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.

Update Envelope Amplitude: 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.

Upper Points (if Upper Limit is selected)
Lower Points (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.

Upper Offset (if Limit is toggled to Upper)
Lower Offset (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 ± 100 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.

Upper Shape (if Limit is toggled to Upper)
Lower Shape (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. Figure 2-72 is an example of a Square Limit Envelope.

Back: Press this submenu key to return to the “Limit Menu” on page 2-79.

Figure 2-71. SPA Limit Envelope Menu

Square Limit Envelope Example

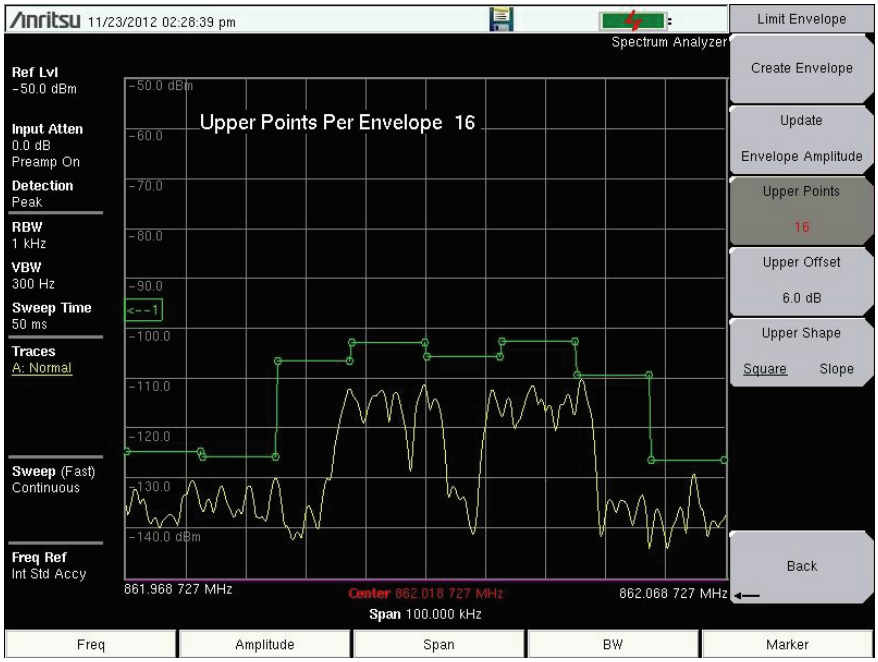


Figure 2-72. Square Limit Envelope

Sloped Limit Envelope Example

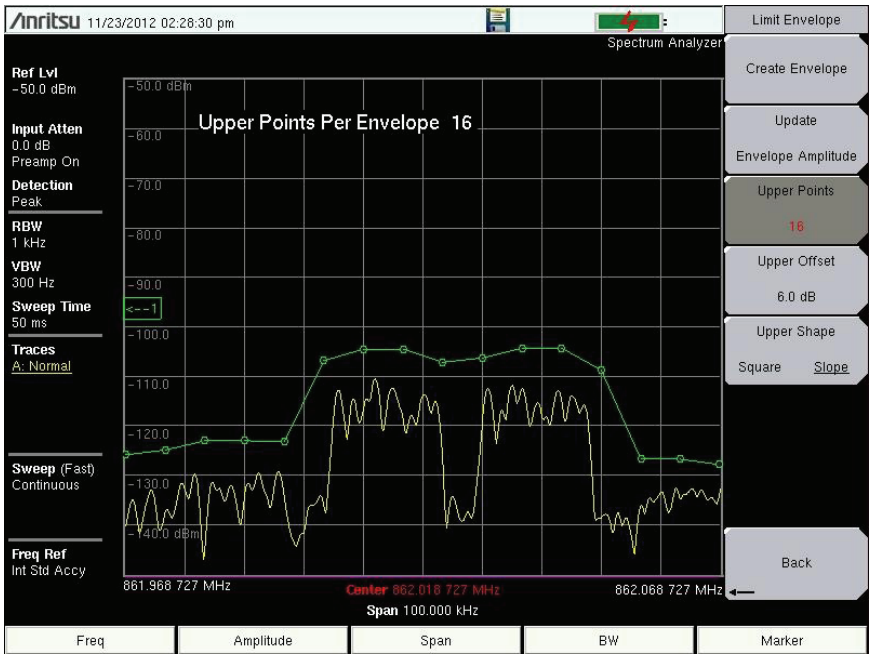
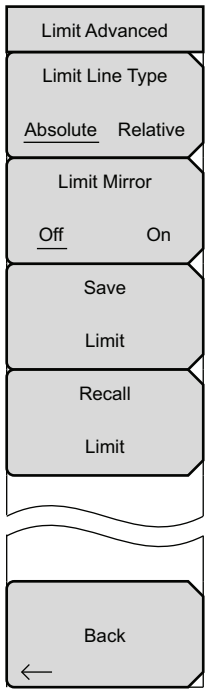


Figure 2-73. Sloped Limit Envelope

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.

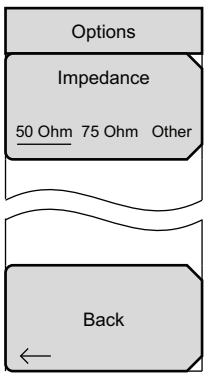
If you recall an absolute limit, and if it is off screen, then you will see the left or right limit off-screen indicator on the edge of the screen.

Back: Press this submenu key to return to the “Limit Menu” on page 2-79.

Figure 2-74. SPA Limit Advanced Menu

2-36 Application Options Menu

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 2-75. SPA Application Options Menu

2-37 Other Menus

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

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:

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

Note	Set the instrument to Interference Analyzer mode for all the measurements in this chapter.

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 2-11 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 60 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.

Note	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.

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 or 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.

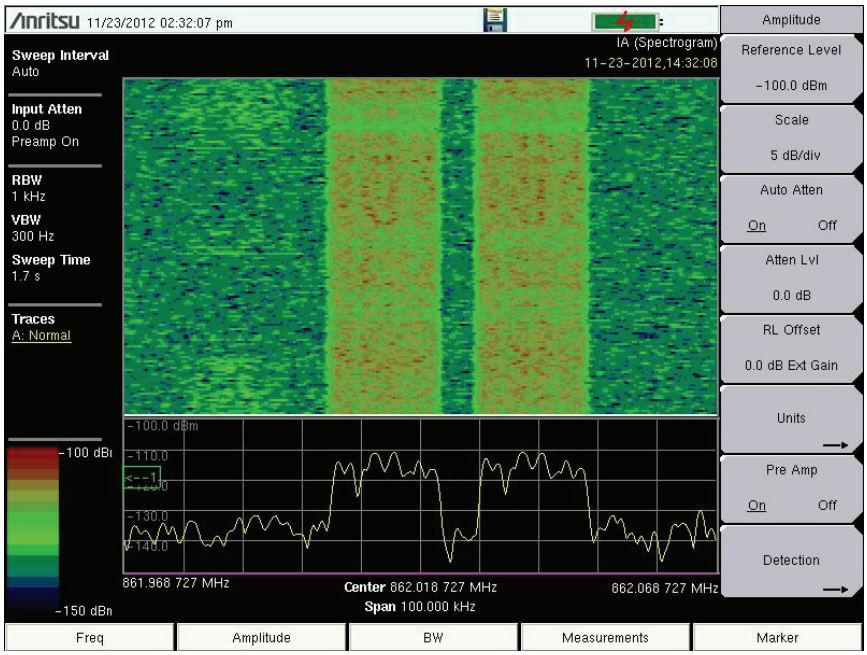


Figure 3-1. Interference Analyzer Spectrogram

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 or down arrow keys to adjust the volume.

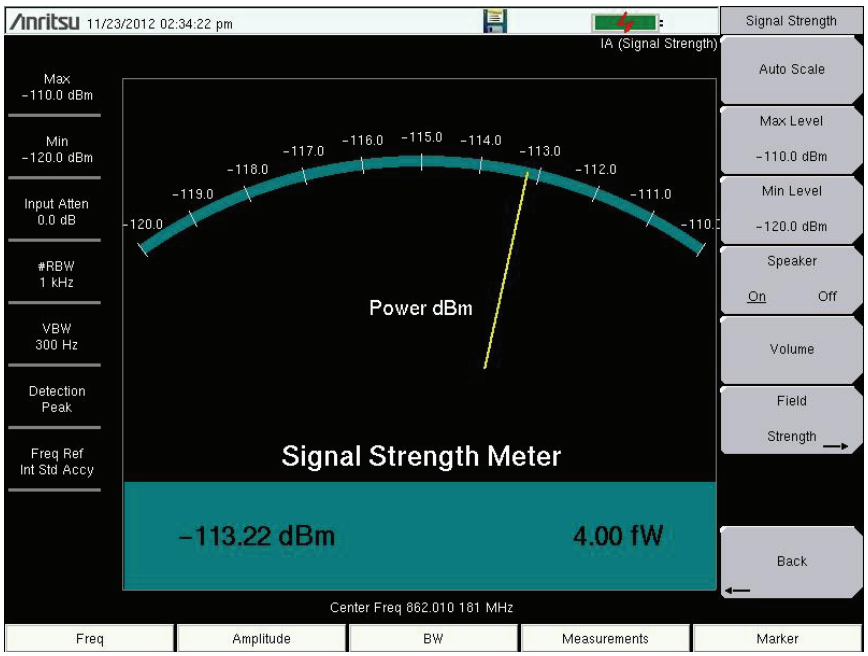


Figure 3-2. Interference Analyzer Signal Strength

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.

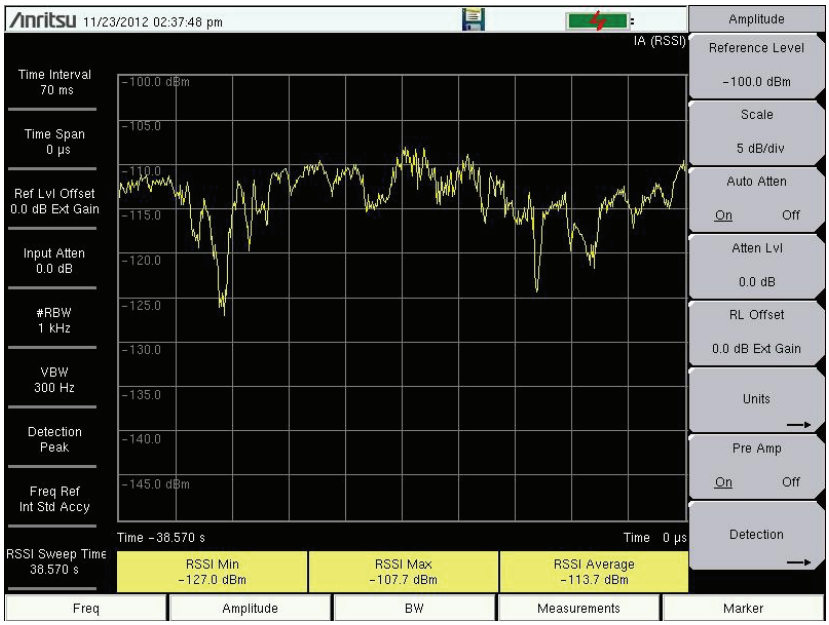


Figure 3-3. Interference Analyzer RSSI

3-7 Signal ID

Note	Select a non-zero span measurement mode before starting this procedure.

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 only), 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.

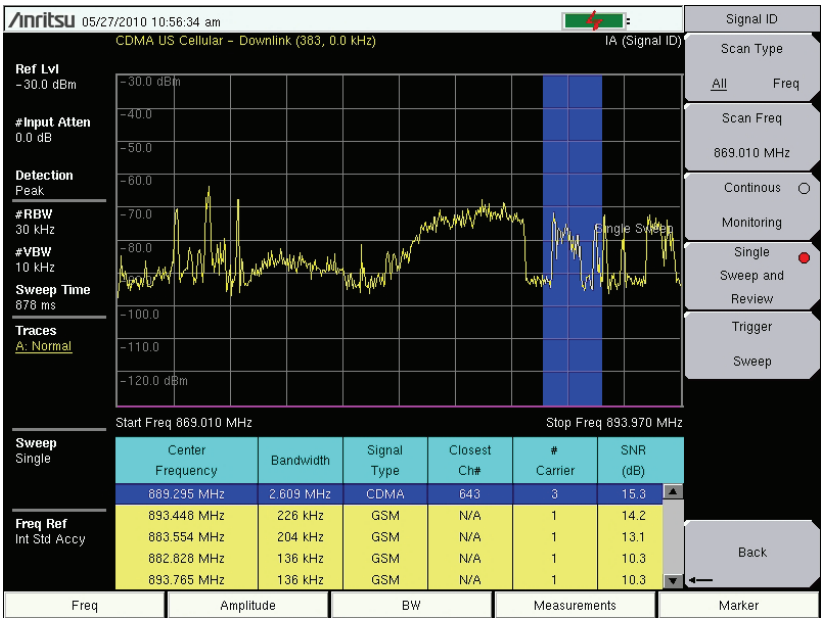


Figure 3-4. Interference Analyzer Signal ID, All Scan Type

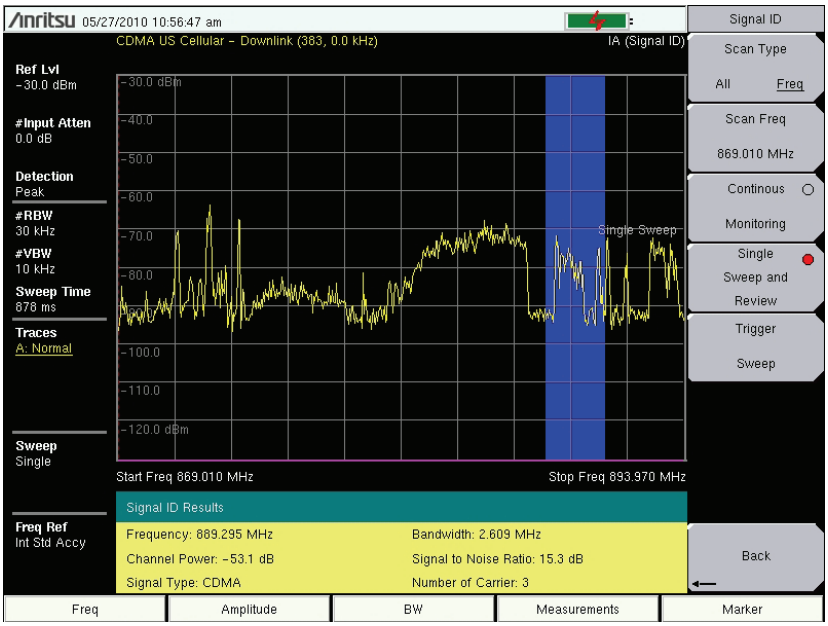


Figure 3-5. Interference Analyzer Signal ID, Freq Scan Type

3-8 Interference Mapping

Note	Interference Mapping requires GPS Option 31 or the MA2700 which contains a GPS module.

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

The easyMap Tools program creates single panel maps (.map) compatible with the Anritsu instruments. You can use easyMap Tools to create pan and zoom maps (.azm) compatible with the BTS Master. The software imports maps from OpenStreetMap and Google Maps and creates files with or without GPS information. Anritsu easyMap Tools is available from the Anritsu website (www.anritsu.com).

Note	For a list of supported instruments, refer to easyMap Tools Help.

With a valid GPS signal, the instrument will identify the current location on the displayed map with a plus sign. Saved locations are displayed with an orange square. 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.

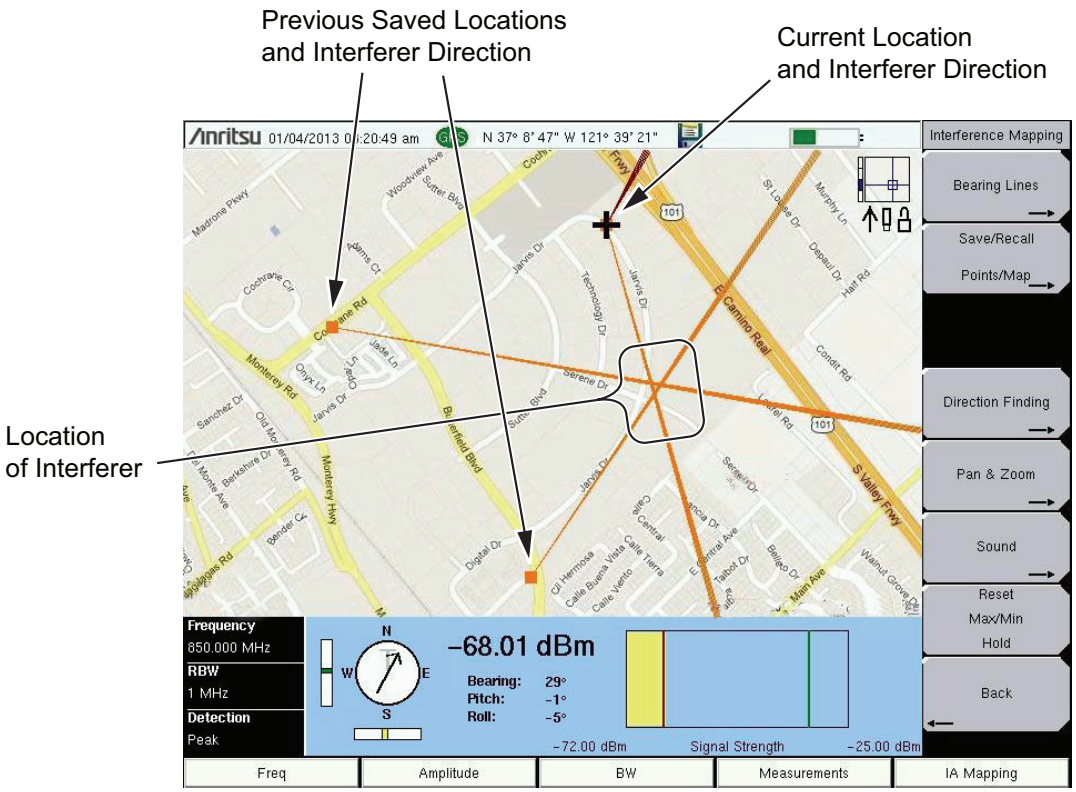


Figure 3-6. Interference Mapping with the MA2700 Handheld Direction Finding System

Overview

1. Capture a map using Anritsu easyMap Tools.
2. Copy the map file to a USB memory stick and then insert the memory stick into the Anritsu instrument's USB Type A port. Anritsu recommends copying the map file to the instrument's internal memory.
3. Set the Anritsu instrument to IA mapping and configure the instrument.
4. Load (Recall) the map file.
5. Map the interfering signal.
6. Save the mapping information.
7. View (recall) saved mapping information.
    - Saved Maps and KML points can be viewed on the Anritsu instrument. The user may want to clear any existing points before recalling the map. Refer to "Bearing Lines Menu" on page 3-64.
    - Saved Maps, KML points, Tab Delimited Points, and JPG files can be transferred and viewed on a PC. Refer to "Mapping Save/Recall Menu" on page 3-65.

The actual mapping process varies based on the direction finding equipment. The process is described in the following sections:

- "Interference Mapping (Antenna Only)" on page 3-10
- "Interference Mapping (MA2700 and Antenna)" on page 3-14

Note	Some steps that are identical to both processes are repeated for easier reading.

- "Save the Mapping Information" on page 3-19

Note	Measurement updates (including bearing and signal strength) are controlled by settings of the Anritsu instruments **Sweep** menu (Shift+3) settings and Triggering Source (**Sweep** > Triggering > Trigger Source) settings. The preset parameters (Sweep = Continuous and Trigger Source = Free Run) allow for continuous measurement updates. If the instrument display is not updating as expected, confirm these settings. Additional information is available in "Sweep Menu" on page 3-72 and "Triggering Source Menu" on page 3-75.

Interference Mapping (Antenna Only)

Note

Anritsu instrument requirements:

- Option 31, GPS is required for Interference Mapping.
- Option 25, Interference Analysis
- Anritsu easyMap Tools requires SPA module V6.00 or higher firmware.
- Directional antenna and compass

1. Capture a map using Anritsu easyMap Tools.

Anritsu easyMap Tools allows you to capture maps of any location and create Anritsu Map Files. These Geo-enabled maps are viewed on the Anritsu instrument during interference mapping. There are two Anritsu Map Files formats: (.map and .azm) used for Interference Mapping.

- .azm map files allow Pan and Zoom on the instrument.
- .map map files are in a legacy format compatible with older firmware.

Download easyMap Tools from the Anritsu website (www.anritsu.com). Additional information about easyMap Tools is available in the software Help.

Note The coverage map should extend beyond the estimated location of bearing readings and have the general location of the interferer centered in the map.

2. Move the map file to the Anritsu instrument.

Copy the map file to a USB memory stick and then insert the memory stick into the Anritsu instrument's USB Type A port. Anritsu recommends copying the map file to the instrument's internal memory. Refer to Anritsu instrument User Guide for additional information.

3. Set the Anritsu instrument to IA Mapping and configure the instrument.

A. Connect a directional antenna in the frequency range of interest to the Anritsu instrument's RF In connector.

B. 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**.

C. Press the **Measurements** main menu key then press the Interference Mapping submenu key twice to display the Interference Mapping menu.

D. 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 lock. When it does the GPS icon at the top of the screen is solid green and location information is displayed. Refer to the User Guide for your instrument for additional information about GPS.

E. Set the frequency (**Freq** > Center Freq) for mapping.

4. Load (Recall) the map file.

The instrument allows you to recall a .map or .azm file (created with Anritsu easyMap Tools). 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.

A. Press the **IA Mapping** main menu key at the bottom of the screen.

B. Press the Save/Recall Points/Map submenu key.

C. Press Recall a Map and select the File Type (AZM or MAP).

D. Use the arrow keys to scroll down to the desired map and press Enter to select.

E. The new map file will be displayed and the current location (if within the GPS boundaries of the displayed map) is shown as a plus sign.

F. AZM maps allow zoom and pan, refer to "Pan & Zoom Menu" on page 3-67 for additional information.

G. If the current location is outside the map boundaries, a black arrow will indicate the direction of the current location in relation to the displayed map.

or Recall the Default Grid Option

With a valid GPS signal, the instrument is able to make interference mapping measurements even when an Anritsu easyMap Tools file of the current location is not available. Location, signal strength, and bearing information can be saved in a (.kml) file. Details of each time the Save Current Bearing 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 3-65 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. For example, 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.

A. Press the **IA Mapping** main menu key at the bottom of the screen.

B. Press the Save/Recall Points/Map submenu key.

C. Press the Recall Default Grid submenu key.

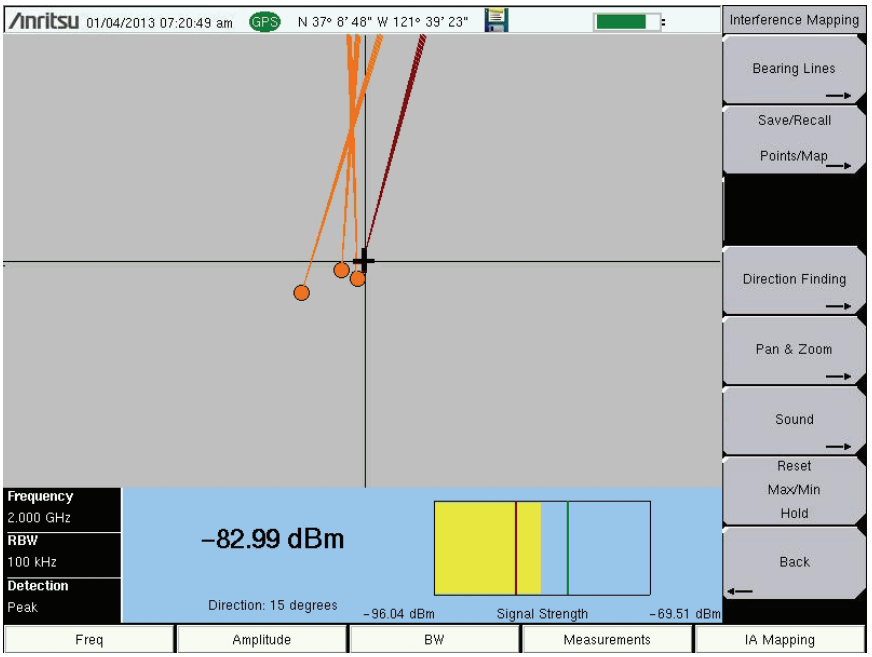


Figure 3-7. Locating an Interfering Signal with the Default Grid

5. Map the interfering signal.

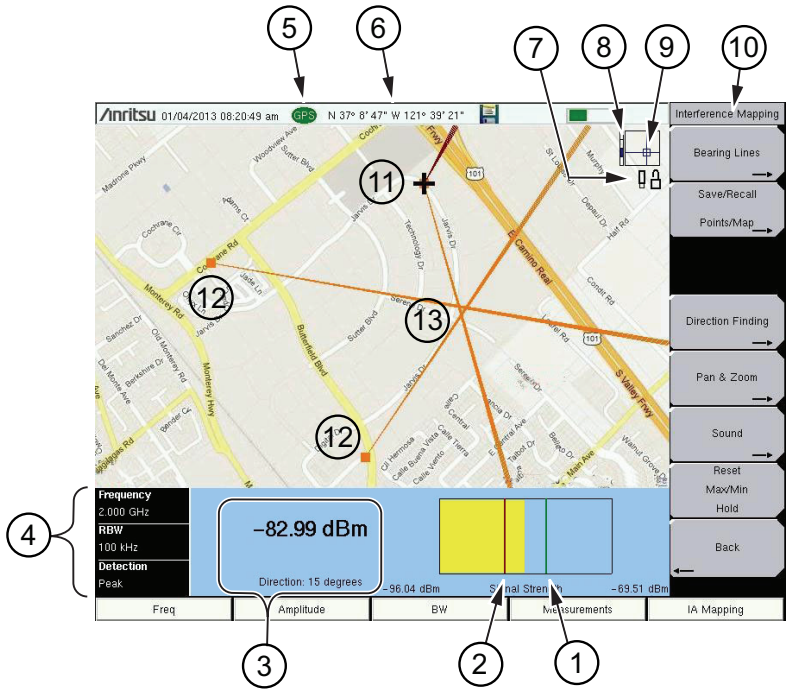
Once you have the GPS signal, directional antenna, and the GeoEmbedded map or the default grid map loaded on instrument, you can start locating interfering signals. The plus sign shows the current location on the screen.

A. Press the **Measurements** main menu key then the Interference Mapping submenu key.

B. Use the directional antenna to locate the bearing of the strongest signal. Rotate the knob on the Anritsu instrument until the red line on the display is aligned with the direction of the interfering signal. Under the Bearing Lines submenu, press the Save Current Bearing Location & Direction key to save the current location and direction.

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 (or a landmark) of the strongest signal before pressing the Save Current Bearing Location & Direction submenu key.

C. Move to the next location and repeat step 5B. You now have two lines on the screen and an idea of where the interfering signal is located. Pan & Zoom as needed (if using an AZM map). An an example of interference mapping where approximate location of the interferer is determined is shown in Figure 3-8 on page 3-13.



1	Maximum signal level.
2	Minimum signal level.
3	Current readings. • Power level: Displays the power level at the Anritsu instrument's receiver. • Direction: Bearing of the active vector (red). Adjust with the rotary knob on the Anritsu instrument.
4	Current Anritsu instrument settings.
5	GPS lock icon.
6	Current position.
7	Status Icons. Refer to Figure 3-63 on page 3-68.
8	Zoom level indication (when using .azm maps). Top in maximum zoomed in position. Bottom is maximum zoomed out position. Refer to "Pan & Zoom Menu" on page 3-67.
9	Current tile location in base map (when using .azm maps).
10	Refer to "Interference Mapping Menu" on page 3-63.
11	Plus sign indicates current position.
12	Previous saved locations and bearings. Existing bearings can be deleted. Refer to "Bearing Lines Menu" on page 3-64.
13	Approximate location of the interfering signal.

Figure 3-8. Interference Mapping Overview

6. Save the Mapping Information

Refer to "Save the Mapping Information" on page 3-19.

Interference Mapping (MA2700 and Antenna)

Note

The Anritsu Instrument must have Interference Analysis (Option 25) and SPA module V6.00 or higher firmware to use Anritsu easyMap Tools.

Anritsu instrument requirements

- Option 25, Interference Analysis
- Anritsu's MA2700 Handheld Direction Finding System (Includes GPS and electronic compass)
- Anritsu easyMap Tools requires SPA module V6.00 or higher firmware.

1. Capture a map using Anritsu easyMap Tools.

Anritsu easyMap Tools allows you to capture maps of any location and create Anritsu Map Files. These Geo-enabled maps are viewed on the Anritsu instrument during interference mapping. There are two Anritsu Map Files formats: (.map and .azm) used for Interference Mapping.

- .azm map files allow Pan and Zoom on the instrument.
- .map map files are in a legacy format compatible with older firmware.

Download easyMap Tools from the Anritsu website (www.anritsu.com). Additional information about easyMap Tools is available in the software Help.

Note The coverage map should extend beyond the estimated location of bearing readings and have the general location of the interferer centered in the map.

2. Move the map file to the Anritsu instrument.

Copy the map file to a USB memory stick and then insert the memory stick into the Anritsu instrument's USB Type A port. Anritsu recommends copying the map file to the instrument's internal memory. Refer to Anritsu instrument User Guide for additional information.

3. Set the Anritsu instrument to IA Mapping and configure the instrument.

A. Connect the RF cable and USB cable from the MA2700 Handheld Interference Hunter (HIH) to the instrument.

B. Calibrate the MA2700. Refer to "Direction Finding Menu" on page 3-66 and the MA2700 User Guide.

C. Connect a directional antenna in the frequency range of interest to the MA2700.

D. Setup the instrument for interference mapping mode by pressing the **Menu** key and selecting the Interference Analyzer icon or press **Shift** then **Mode** (9), highlight Interference Analysis and press **Enter**. Under the **Measurements** main menu, select Interference Mapping.

E. The instrument will detect the connected MA2700 and display the message **MA2700 detected -- Device is ready to use**. After GPS lock, the instrument will use GPS data from the MA2700.

Note	Once detected, the MA2700 can be used to capture bearing and/or GPS data while in other Interference mode measurements and even other supported instrument measurement modes, including Spectrum Analyzer mode.

F. To manually select the MA2700, confirm the MA2700 USB connection, then:

a. Press the **Measurements** main menu key then press the Interference Mapping submenu key twice to display the Interference Mapping menu.

b. Press the Direction Finding submenu button.

c. Press the Direction Finding Antenna Selection submenu button and select MA2700 Handheld.

It may take several minutes for the MA2700 GPS receiver to lock. When it does the GPS icon at the top of the screen is solid green and location information is displayed. Refer to the User Guide for your instrument for additional information about GPS.

G. Set the frequency (**Freq** > Center Freq) for mapping.

4. Load (Recall) the map file.

The instrument allows you to recall a .map or .azm file (created with Anritsu easyMap Tools). 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.

A. Press the **IA Mapping** main menu key at the bottom of the screen.

B. Press the Save/Recall Points/Map submenu key.

C. Press Recall a Map and select the File Type (AZM or MAP).

D. Use the arrow keys to scroll down to the desired map and press Enter to select.

E. The new map file will be displayed and the current location (if within the GPS boundaries of the displayed map) is shown as a plus sign.

F. AZM maps allow zoom and pan, refer to "Pan & Zoom Menu" on page 3-67 for additional information.

G. If the current location is outside the map boundaries, a black arrow will indicate the direction of the current location in relation to the displayed map.

or Recall the Default Grid Option

With a valid GPS signal, the instrument is able to make interference mapping measurements even when an Anritsu easyMap Tools file of the current location is not available. Location, signal strength, and bearing information can be saved in a (.kml) file. Details of each time the MA2700 trigger is pressed can be viewed at a later time on the instrument or in Google Earth. Refer to "Mapping Save/Recall Menu" on page 3-65 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. For example, 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.

A. Press the **IA Mapping** main menu key at the bottom of the screen.

B. Press the Save/Recall Points/Map submenu key.

C. Press the Recall Default Grid submenu key.

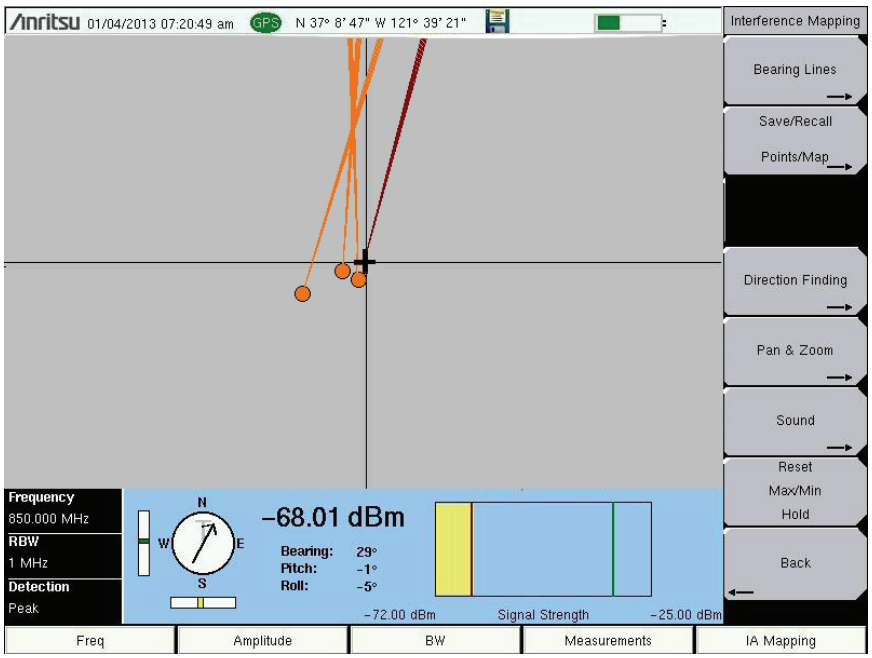


Figure 3-9. Locating an Interfering Signal with the MA2700 and the Default Grid

5. Map the interfering signal with the MA2700.

Once you have a GPS signal from the connected Handheld Interference Hunter with a directional antenna, and the GeoEmbedded map or the default grid map loaded on instrument, you can start locating interfering signals. The plus sign shows the current location on the screen.

A. Press the **Measurements** main menu key then the Interference Mapping submenu key.

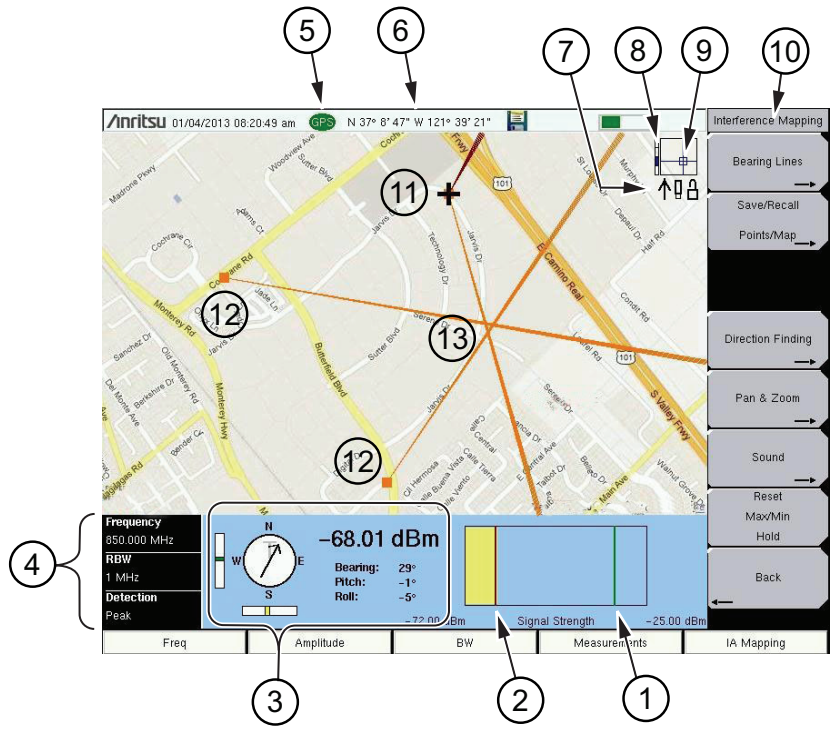
B. Use the MA2700 HIH with a directional antenna to locate the bearing of the strongest signal. When the HIH is aligned with the direction of the interfering signal briefly pull and release the trigger on the Handheld Interference Hunter to record the current location and bearing line of the interferer.

Pulling the MA2700 trigger will prompt the Anritsu analyzer to beep. Releasing the pulled trigger has two functions:

- Release the trigger after the initial beep (< 1 second) to capture location and signal data.
- Release the trigger after the second beep (~ 2 seconds) to toggle the preamp in the MA2700 and the Anritsu analyzer On or Off.

The compass acquires the bearing line data for the MA2700 Handheld Interference Hunter. The compass will display a light gray T or M; T for true North, M for magnetic North. The pitch and roll indicators will display the how level and plumb the MA2700 is while searching for interference signals. The compass bearing is most accurate when the MA2700 is level. Right of the compass and pitch and roll indicators are the numerical values for Bearing, Pitch, and Roll.

C. Move to the next location and repeat step 5B. You now have two lines on the screen and an idea of where the interfering signal is located. Pan & Zoom as needed (if using an AZM map). An an example of interference mapping with the MA2700 where the approximate location of the interferer is determined is shown in Figure 3-10.



1	Maximum signal level.
2	Minimum signal level.

Figure 3-10. Interference Mapping Overview (1 of 2)

3	Current readings from the MA2700. • Compass: Before GPS lock the compass displays a light gray M indicating magnetic north (no declination adjustment). With GPS lock, a declination adjustment is automatically applied based on location and the compass changes to display a light gray T indicating true north. The Arrow indicates the direction the MA2700 is pointing. • Power level: Displays the power level at the Anritsu instrument's receiver. • Bearing: Direction the MA2700 is pointing (shown in red). • Pitch (vertical level): Indicates the front-to-back orientation. • Roll (horizontal level): Indicates the side-to-side orientation.
4	Current Anritsu instrument settings.
5	GPS lock icon.
6	Current position.
7	Status Icons (left to right). Refer to Figure 3-63 on page 3-68. • MA2700 USB connection • USB memory stick available. • Map auto-centering mode.
8	Zoom level indication (when using .azm maps). Top in maximum zoomed in position. Bottom is maximum zoomed out position. Refer to "Pan & Zoom Menu" on page 3-67.
9	Current tile location in base map (when using .azm maps). Move the current tile location around the base map using the arrow keys on the Anritsu analyzer. **Note:** Panning is not functional when the instrument displayed map is at the maximum zoomed out position.
10	Refer to "Interference Mapping Menu" on page 3-63.
11	Plus sign indicates current position.
12	Previous saved (trigger pull) locations and bearings. Existing bearings can be deleted. Refer to "Bearing Lines Menu" on page 3-64.
13	Approximate location of the interfering signal.

Figure 3-10. Interference Mapping Overview (2 of 2)

6. Save the Mapping Information

Refer to "Save the Mapping Information" on page 3-19.

Save the Mapping Information

There are three save options in Interference Mapping:

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.

The JPG file can be viewed on a PC.

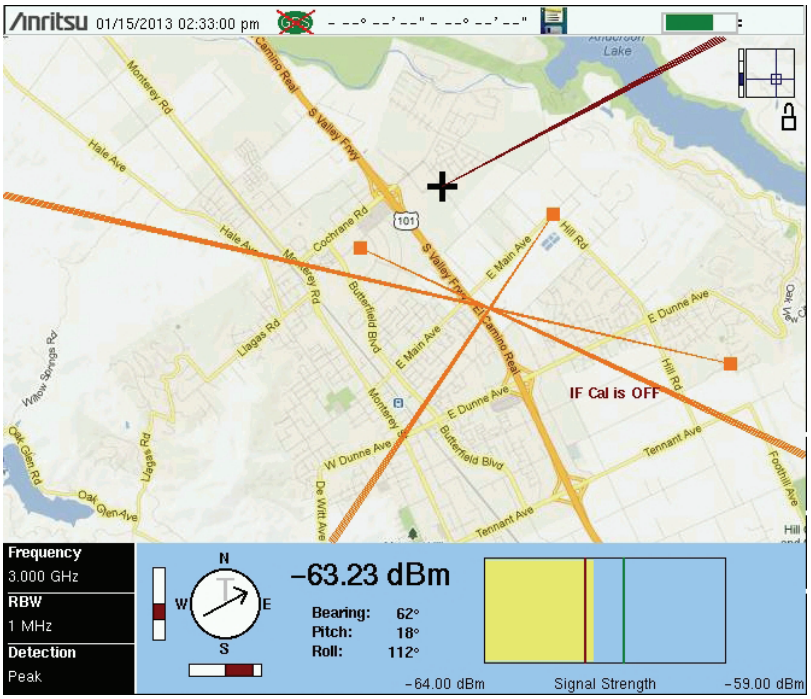


Figure 3-11. Displaying a Saved JPG File on a PC

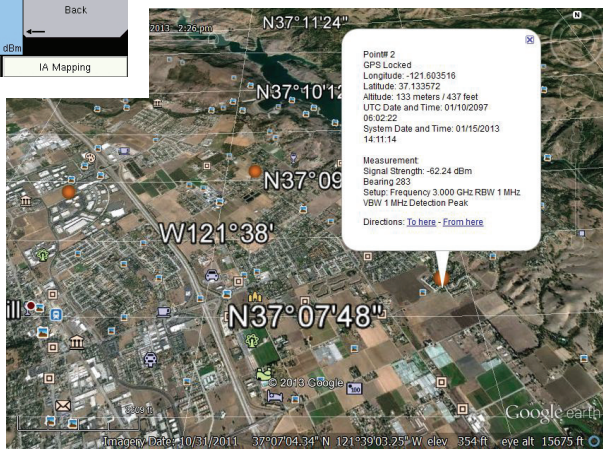
Save KML Points

Press Save/Recall Points/Map then Save KML Points. At the Save menu, select KML 2D or KML 3D, then 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 on a PC with Google Earth (http://earth.google.com/) and also recalled and viewed on the instrument (Figure 3-12). Refer to "Mapping Save/Recall Menu" on page 3-65 for additional information.

KML File Recalled on Anritsu Instrument



KML File Opened in Google Earth

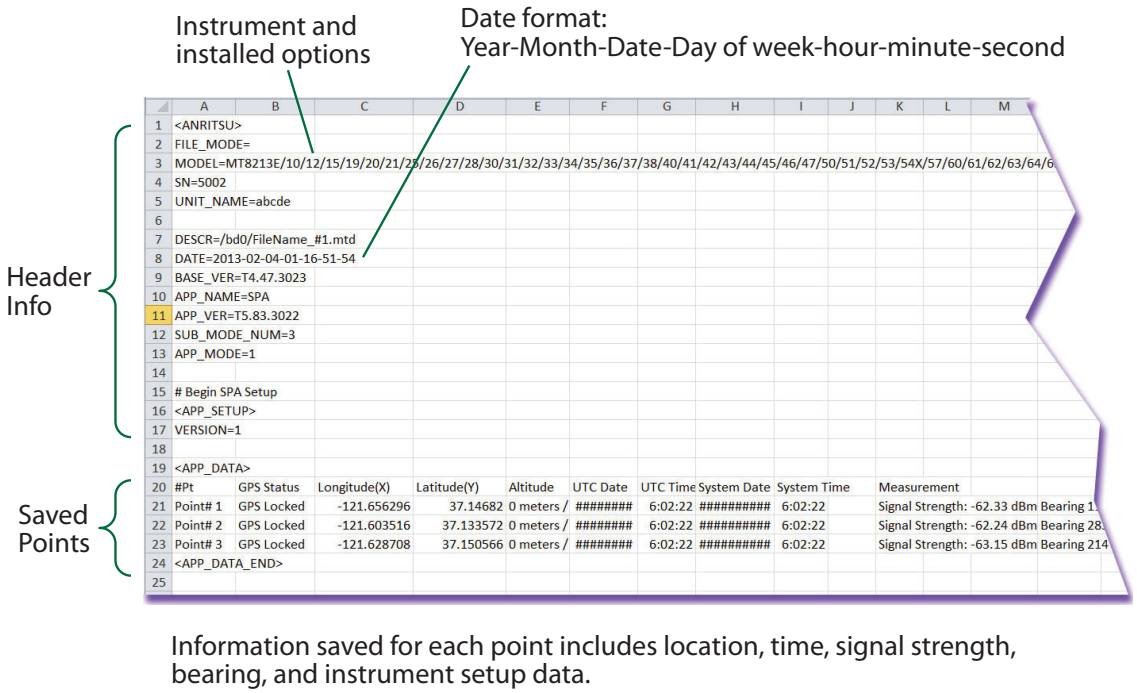
Figure 3-12. KML File on the PC and the Anritsu Instrument

Note	To delete existing bearings before recalling a map, refer to "Bearing Lines Menu" on page 3-64.

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.

The Mapping Tab Delimited (.mtd) file can be viewed on a PC in a text editor or excel (Figure 3-13).



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	<ANRITSU>												
2	FILE_MODE=												
3	MODEL=MT8213E/10/12/15/19/20/21/25/26/27/28/30/31/32/33/34/35/36/37/38/40/41/42/43/44/45/46/47/50/51/52/53/54X/57/60/61/62/63/64/6												
4	SN=5002												
5	UNIT_NAME=abcde												
6													
7	DESCR=/bd0/FileName_#1.mtd												
8	DATE=2013-02-04-01-16-51-54												
9	BASE_VER=T4.47.3023												
10	APP_NAME=SPA												
11	APP_VER=T5.83.3022												
12	SUB_MODE_NUM=3												
13	APP_MODE=1												
14													
15	# Begin SPA Setup												
16	<APP_SETUP>												
17	VERSION=1												
18													
19	<APP_DATA>												
20	#Pt	GPS Status	Longitude(X)	Latitude(Y)	Altitude	UTC Date	UTC Time	System Date	System Time		Measurement		
21	Point# 1	GPS Locked	-121.656296	37.14682	0 meters /	########	6:02:22	##########	6:02:22		Signal Strength: -62.33 dBm Bearing 1		
22	Point# 2	GPS Locked	-121.603516	37.133572	0 meters /	########	6:02:22	##########	6:02:22		Signal Strength: -62.24 dBm Bearing 28		
23	Point# 3	GPS Locked	-121.628708	37.150566	0 meters /	########	6:02:22	##########	6:02:22		Signal Strength: -63.15 dBm Bearing 214		
24	<APP_DATA_END>												
25													

Figure 3-13. MTD File Opened in Excel

3-9 Interference Analyzer (IA) Menu Maps

Figure 3-14 though Figure 3-23 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. Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to menu descriptions).

Main Menu Keys are used to display the highest-level submenu key menus. Note that the **Marker** and **Measurements** menus are on the following pages.

Figure 3-14. Main Menu Keys

Measurements Menu (1 of 4)

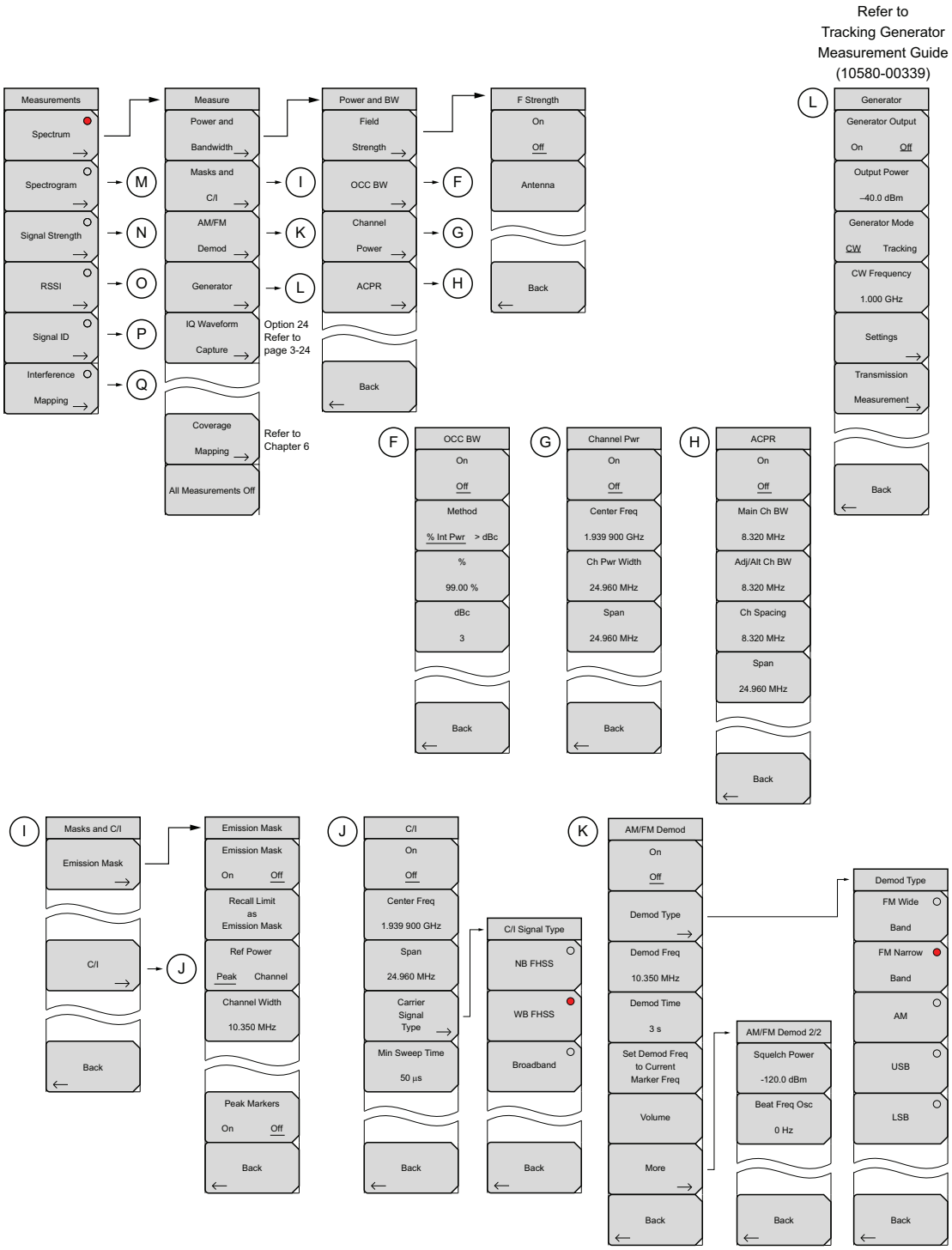


Figure 3-15. Measurements Menu Keys

Measurements Menu (2 of 4)

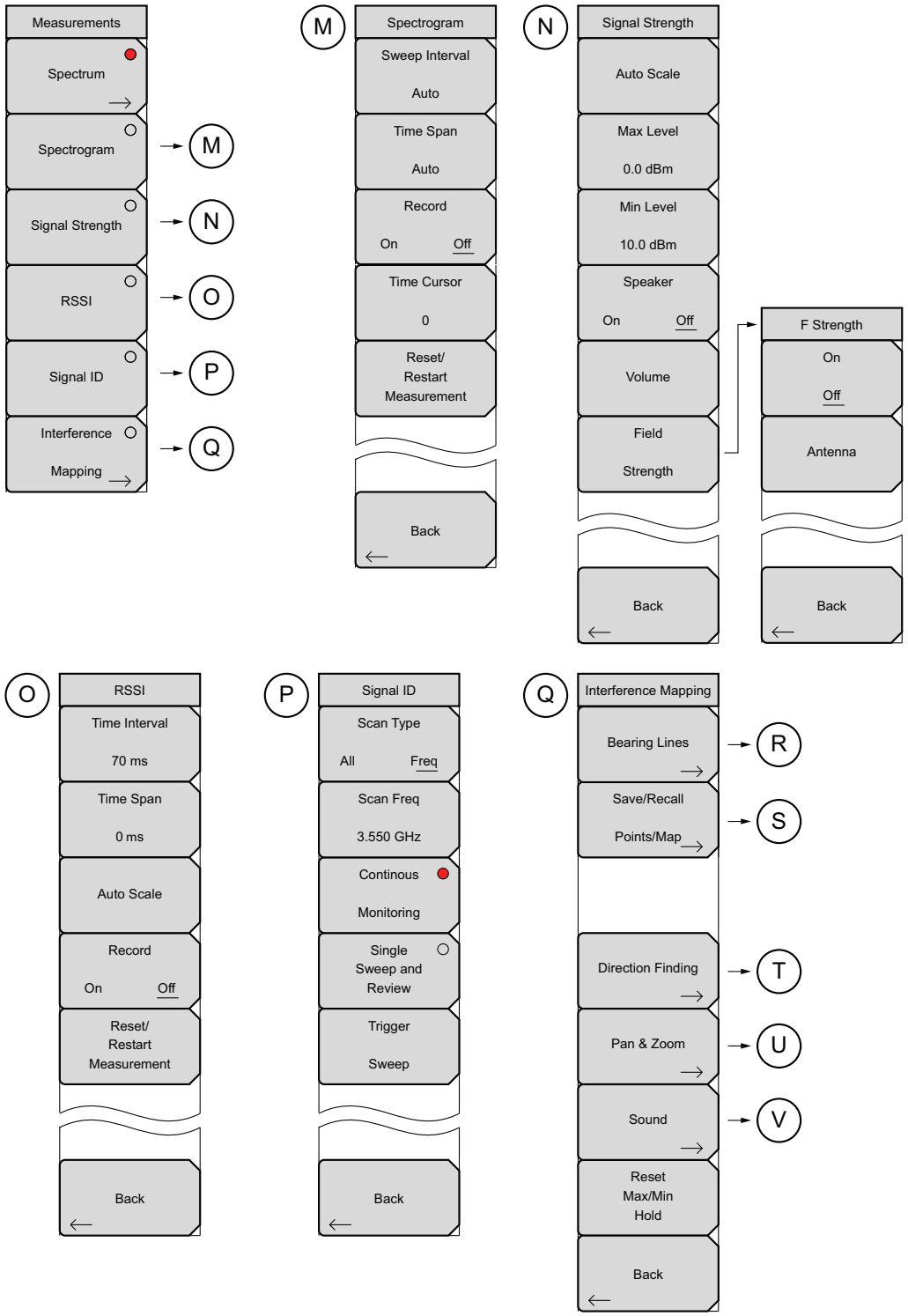


Figure 3-16. Measurements Submenu Keys

Measurements Menu (3 of 4)

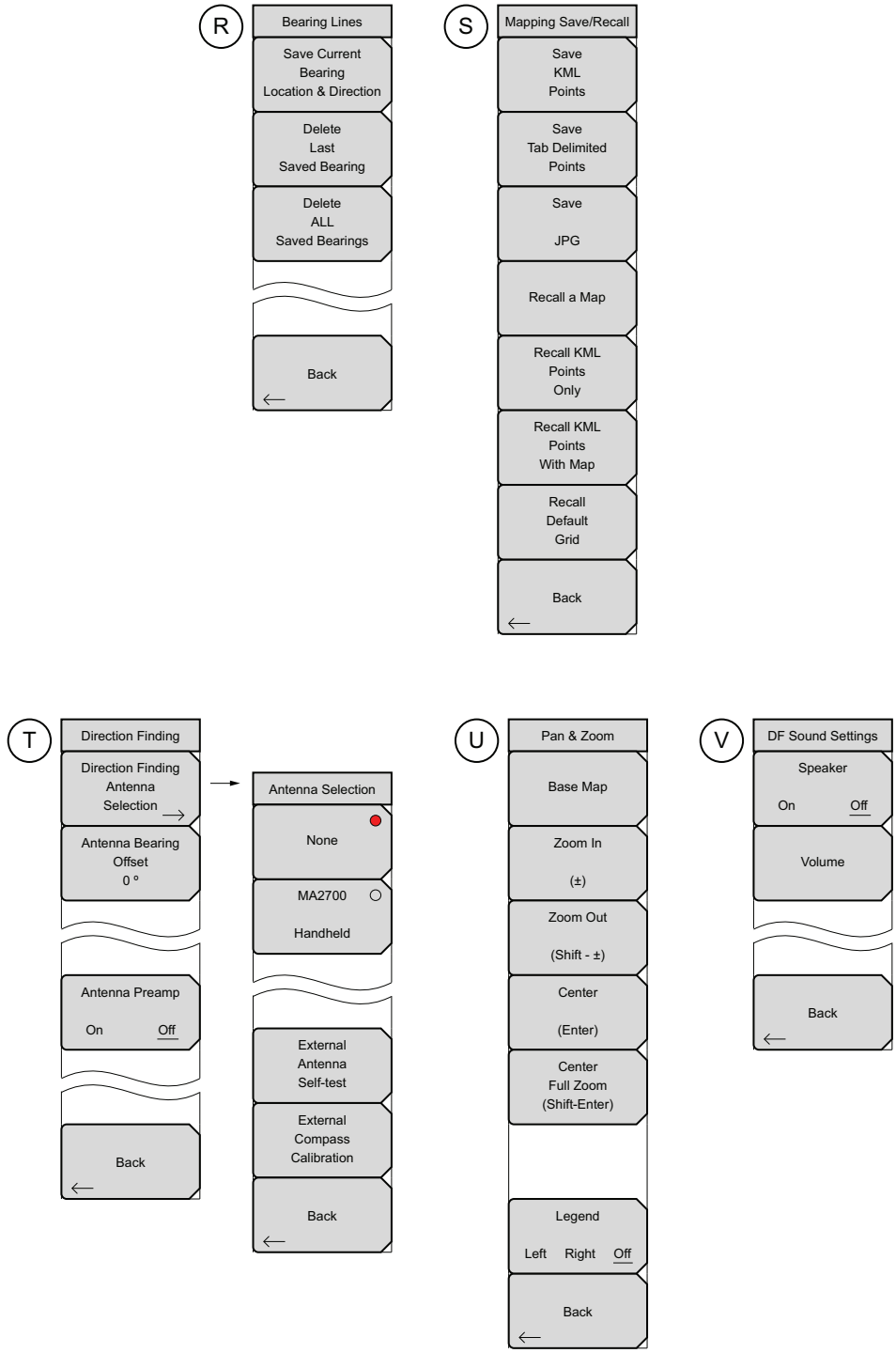


Figure 3-17. Measurements Submenu Keys

Measurements Menu (4 of 4)

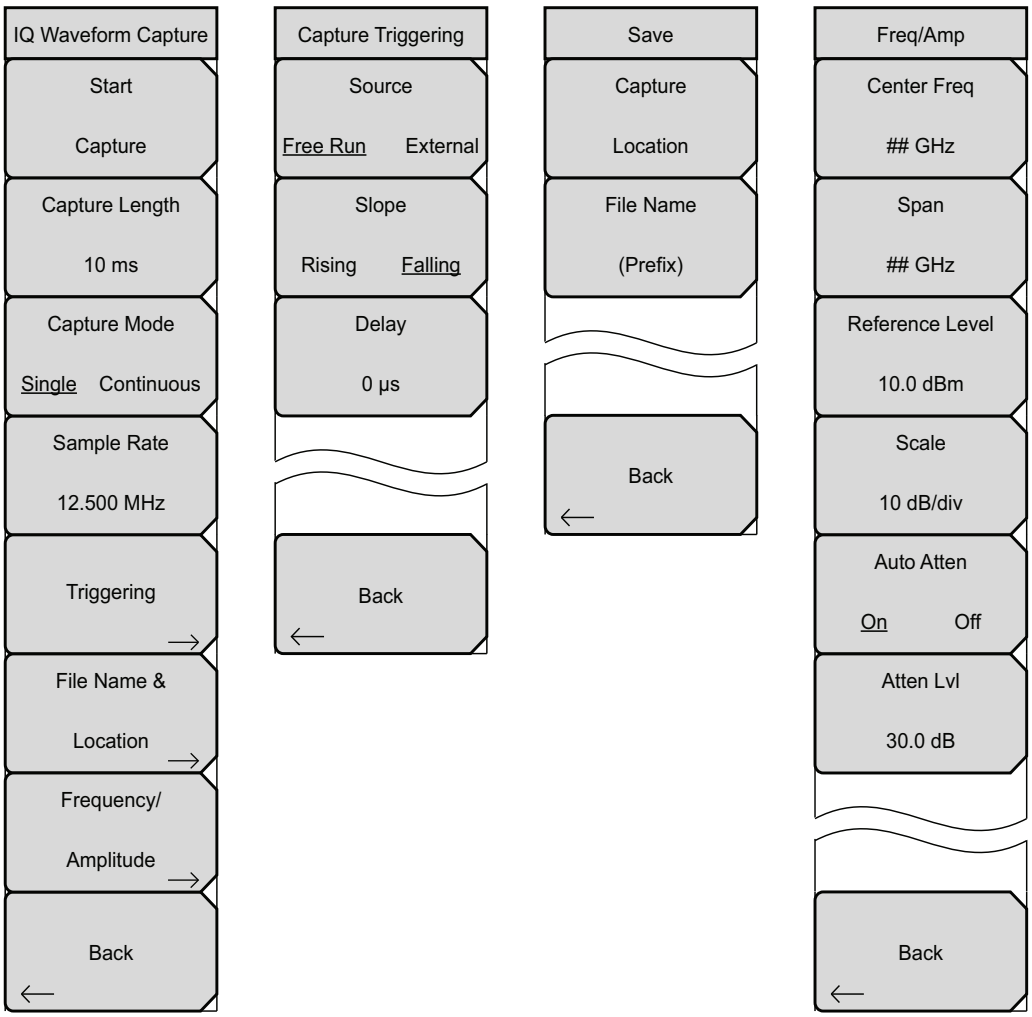


Figure 3-18. IQ Waveform Capture Submenu Keys

Marker Menus

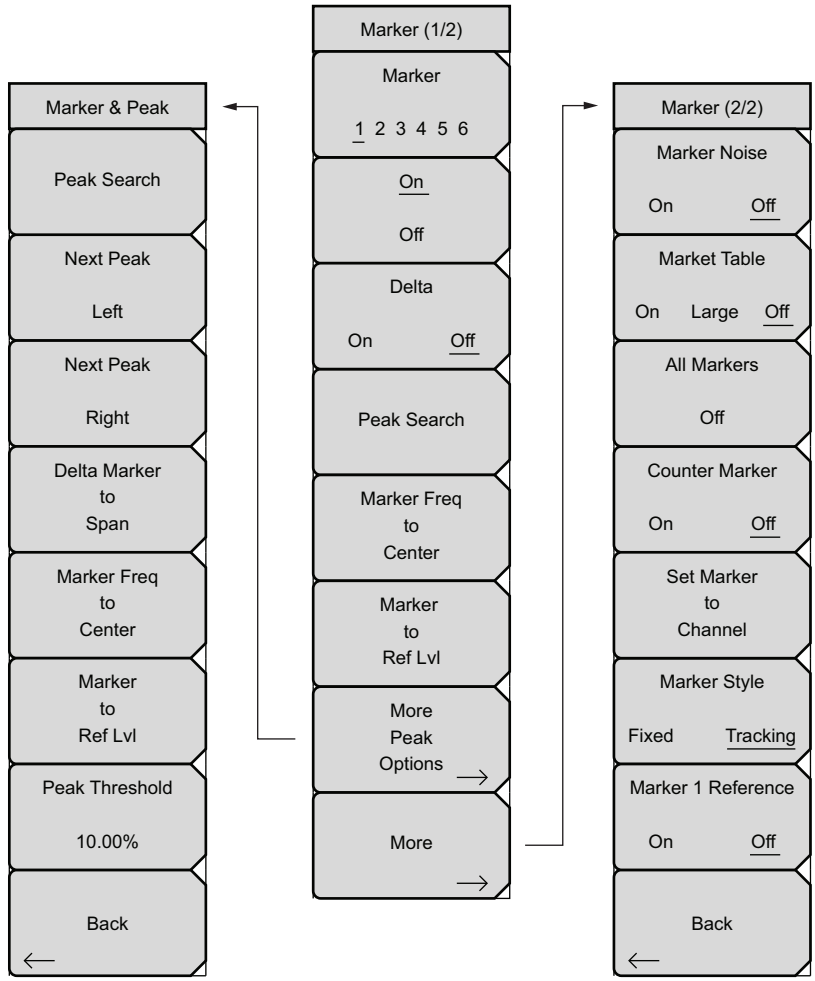


Figure 3-19. Marker Submenu Keys

Note	Not available in Interference Mapping or Coverage Mapping measurements.

Sweep Menus

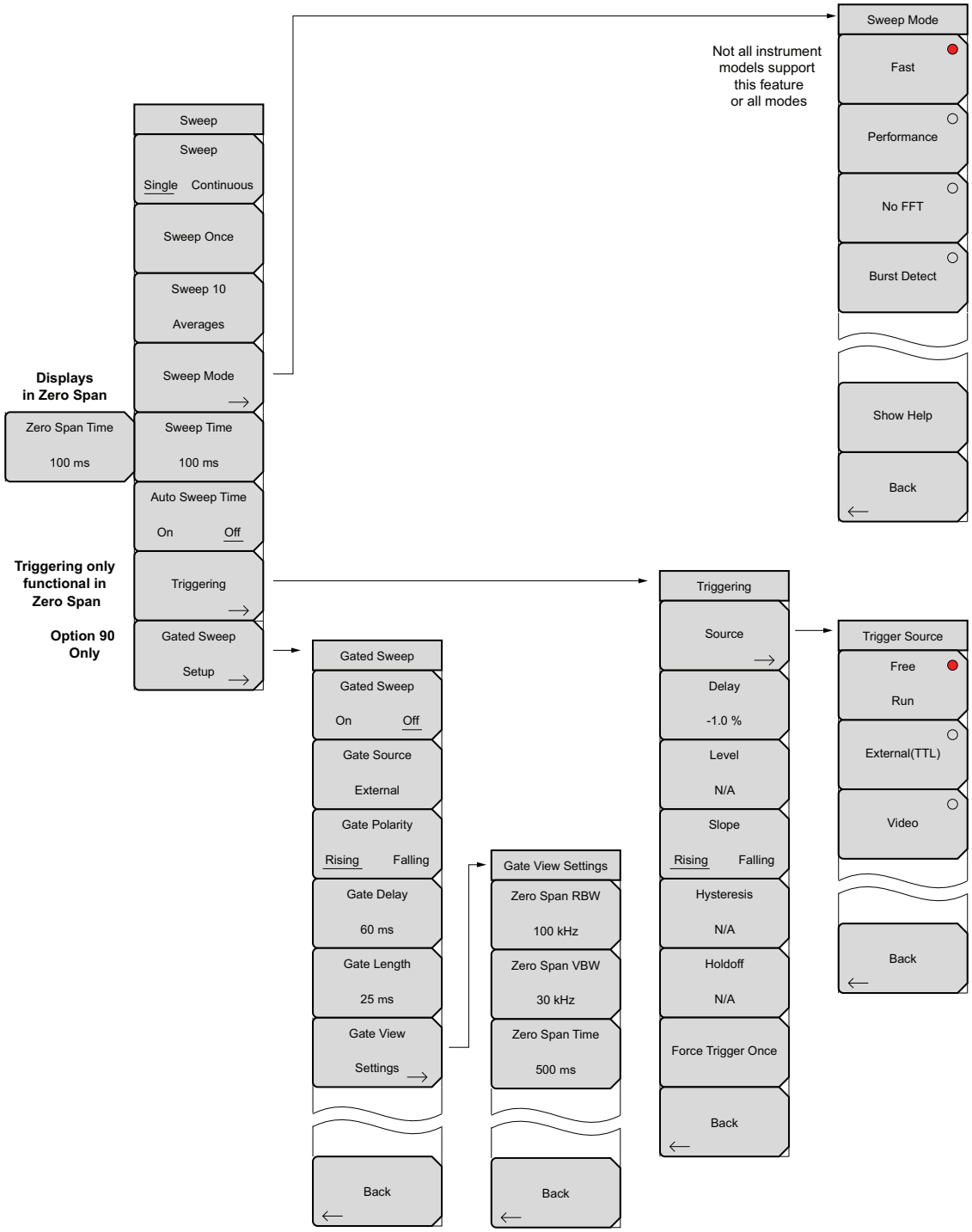


Figure 3-20. Sweep Submenu Keys

Trace Menus

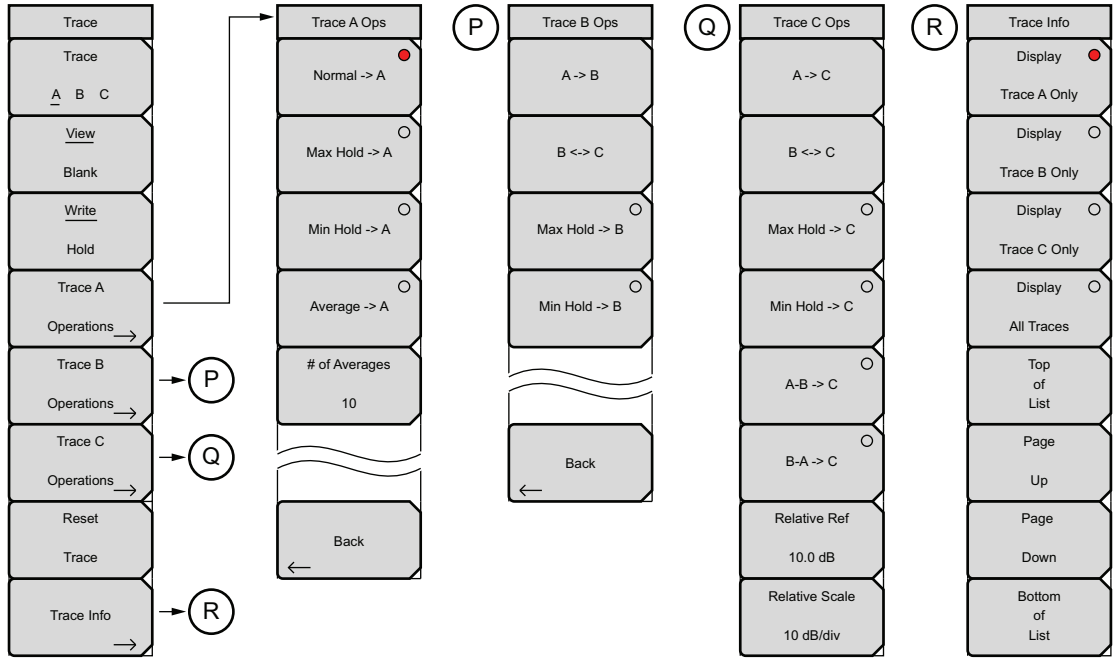


Figure 3-21. Trace Submenu Keys

Limit Menus

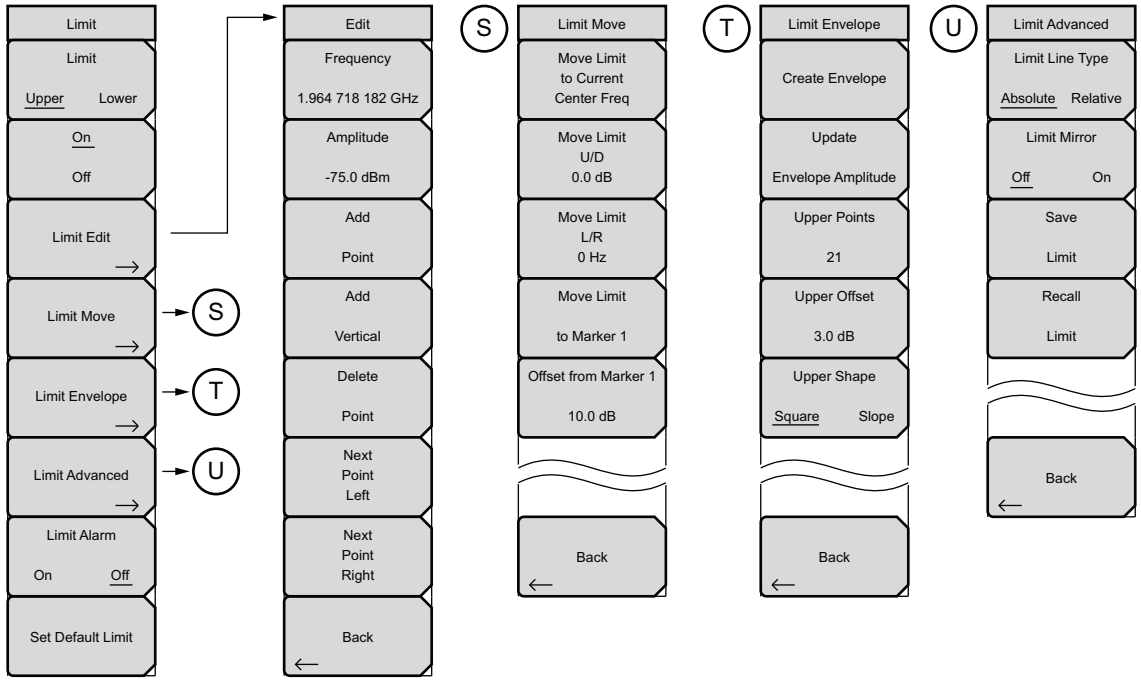


Figure 3-22. Limit Submenu Keys

Application Options Menu

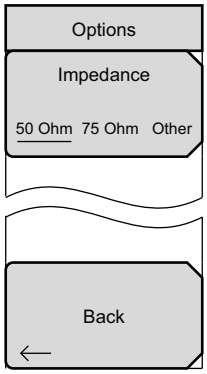
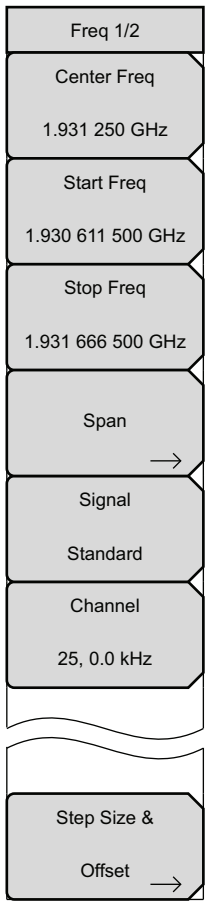


Figure 3-23. Application Options Submenu Keys from System Menu

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.



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 effect 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.

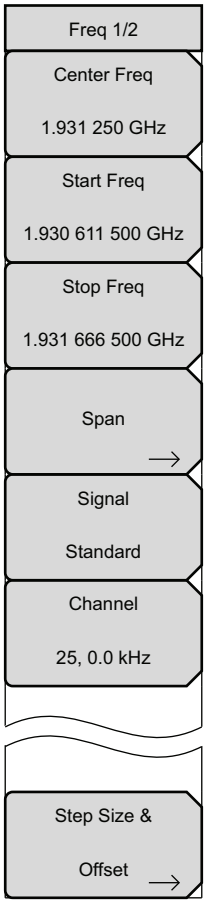
Stop Freq: Press the **Freq** main menu key followed by the Stop Freq submenu key and enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If a stop frequency lower than the current start frequency is entered, the start frequency will be changed to yield a 10 Hz span.

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 3-36.

Figure 3-24. IA Frequency Menu 1/2 (1 of 2)

Freq (Frequency) Menu (Continued)



Signal Standard: Use the up or 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 or 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 3-34. If Freq Offset is any value other than 0 Hz, then the Frequency menu shows “Offset” on the submenu keys for setting frequencies. See “Set the Freq Offset to 0 Hz to remove the frequency offset.” on page 3-33.

Figure 3-25. IA Frequency Menu 1/2 (2 of 2)

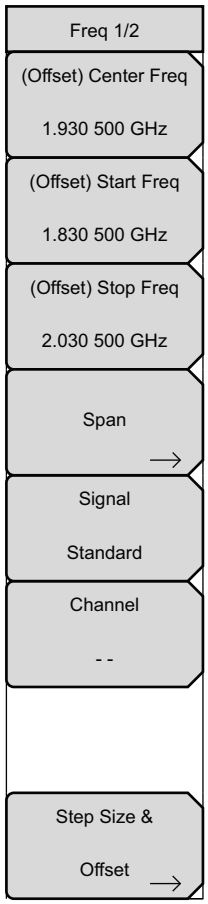
3-11 Frequency Menu with Offset Function

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 3-28) 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 current frequency offset value is displayed in the "Freq 2/2 Menu".



(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 effect 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 3-36.

Signal Standard: Use the up or 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 or 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 3-34.

Figure 3-26. IA Freq 1/2 with Offset Function Menu

Freq 2/2 Menu

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

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 or 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 or 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.

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

Freq Offset: 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 **Enter** key has the same effect as the MHz submenu key.

Offset Step Size: Enter the desired frequency offset step size. The offset frequency step specifies the amount by which the offset frequency will change when the up or down arrow keys are pressed.

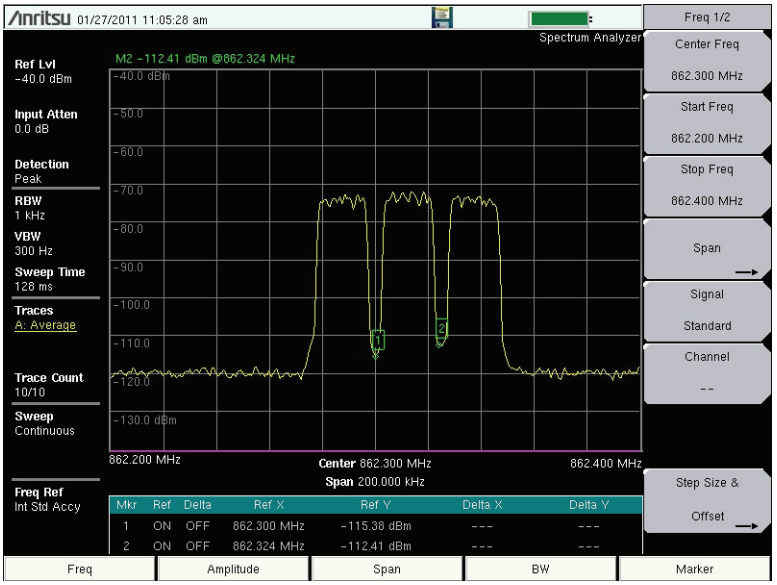
Use the keypad or the rotary knob to change the Offset Step Size.

Back: Returns to the "Frequency Menu with Offset Function" on page 3-33.

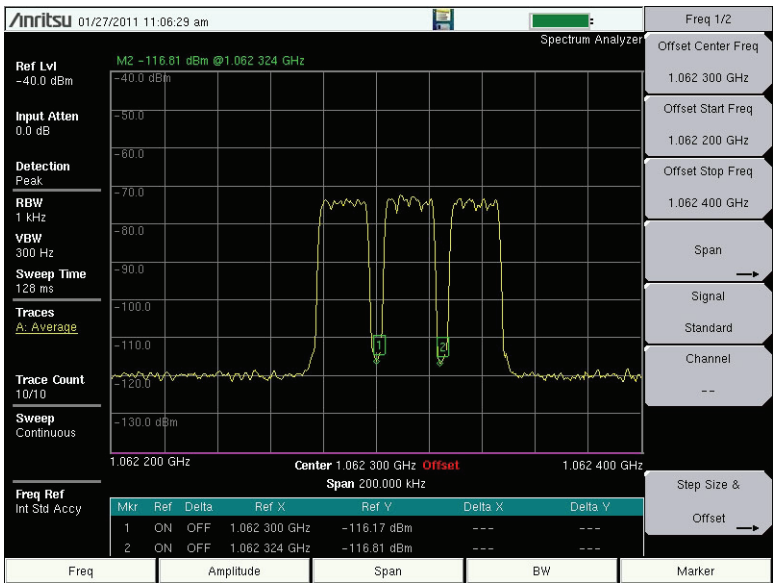
Figure 3-27. IA Freq 2/2 Menu

Frequency Offset Example

Example of Frequency Offset Using the Same Source Signal



No Offset



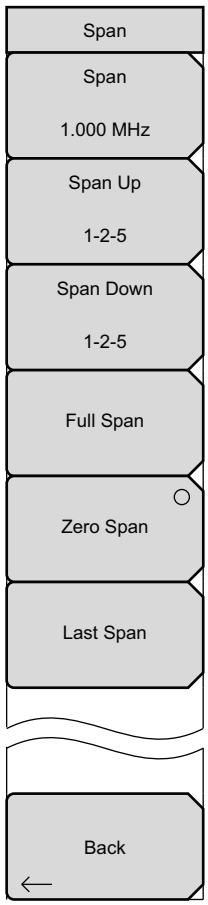
+200 MHz Frequency Offset
(**Freq** > Step Size & Offset > Freq Offset)

Figure 3-28. 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: 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 "Freq (Frequency) Menu" on page 3-31.

Span Up 1-2-5: This is a convenient way to quickly arrive at a wider span value. The first time the submenu key is pressed, the span value increases to the nearest even value that starts with 1, 2, or 5. For example if the span is 1.8 MHz, pressing the submenu key for the first time changes the span to 2.0 MHz, the next press takes the value to 5.0 MHz and so on.

Span Down 1-2-5: This is a convenient way to narrow the frequency span. The first time the submenu key is pressed, the span value decreases to the nearest even value that starts with 1, 2, or 5. For example if the span is 1.8 MHz, pressing the submenu key for the first time changes the span to 1.0 MHz, the next press takes the value to 500 kHz, then 200 kHz and so on.

Full Span: Pressing this button sets the span to cover the entire frequency range of the unit.

Zero Span: 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.

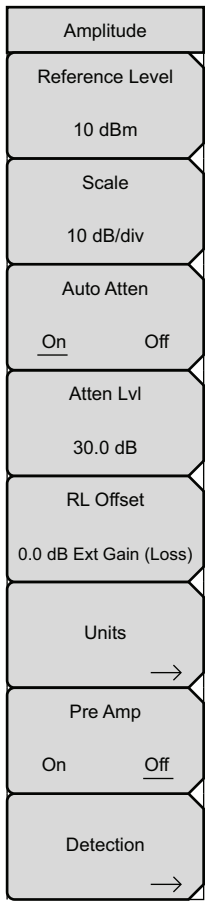
Last Span: This submenu key returns the span to the most recent span value immediately before a change was made.

Back: Returns to the previous menu

Figure 3-29. IA Span Menu

3-12 Amplitude Menu

Key Sequence: **Amplitude**



Reference Level: The reference level is the top grid 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 **Enter** key. The up or down arrow keys change the reference level in 10 dB steps, and the left or right 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.

Scale: 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.

Auto Atten On/Off: 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.

Atten Lvl: Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.

RL Offset xx dB Ext Gain/Loss: 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.

Units: Select the display units from this submenu key:

dBm, dBV, dBmV, dBµV, Volt, Watt, dBW, A, and dBA

Refer to "[Amplitude] Units Menus" on page 3-38.

Press the Back submenu key to return to the Amplitude menu.

Pre Amp On/Off: 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 < –40 dBm.

Detection: 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 "Detection Menu" on page 3-39.

Figure 3-30. IA Amplitude Menu

[Amplitude] Units Menus

Key Sequence: **Amplitude** > Units

Key Sequence: **Amplitude** > Units > More

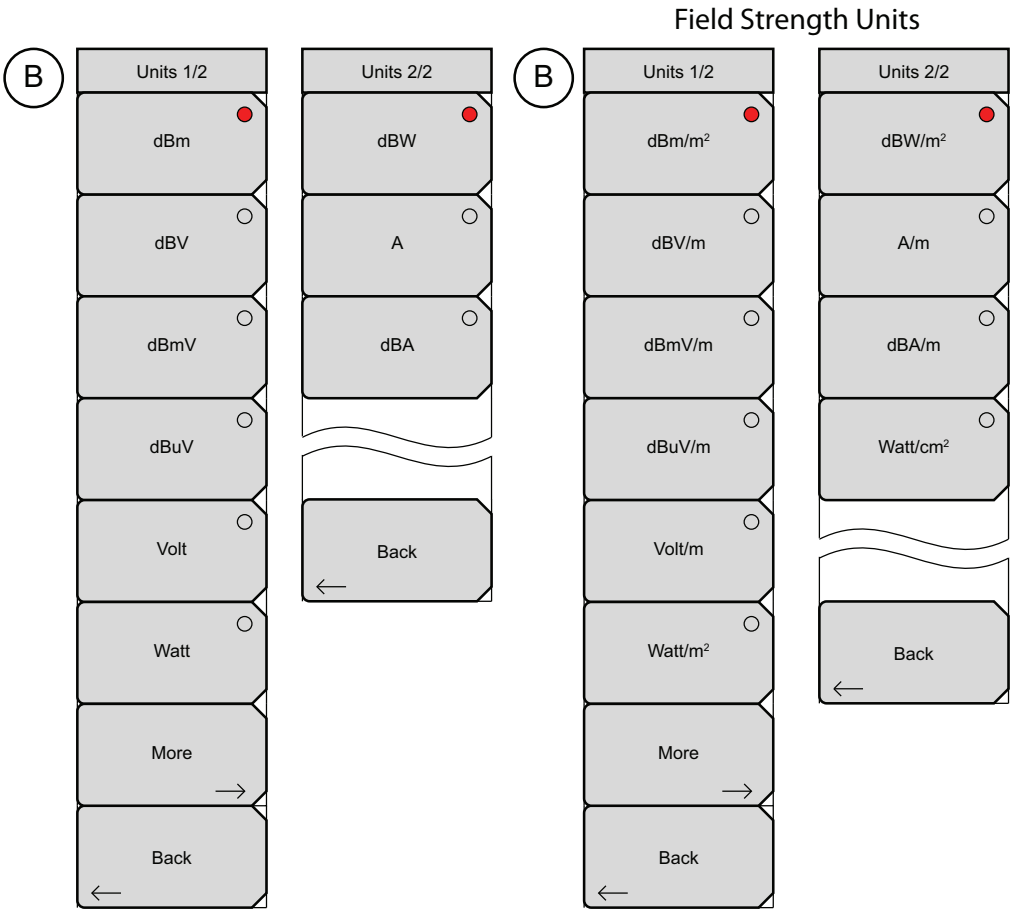


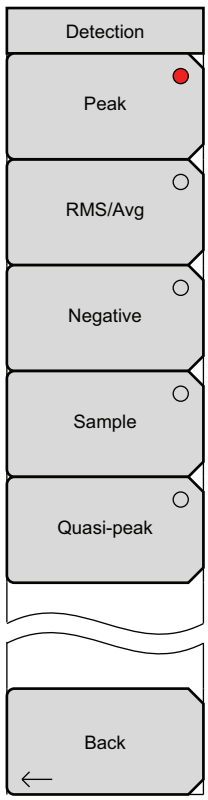
Figure 3-31. IA Units Menus for Amplitude

When measuring Field Strength, units are displayed in power per area units.

From the Units 1/2 menu, pressing the Back key returns the display to the "Amplitude Menu" on page 3-37. Press the More submenu key to display the Units 2/2 menu. From the Units 2/2 menu, pressing the Back key returns the display to the Units 1/2 menu.

Detection Menu

Key Sequence: **Amplitude** > Detection



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

RMS/Avg: 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(power) is displayed for the detector, as well as for VBW and trace average.

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.

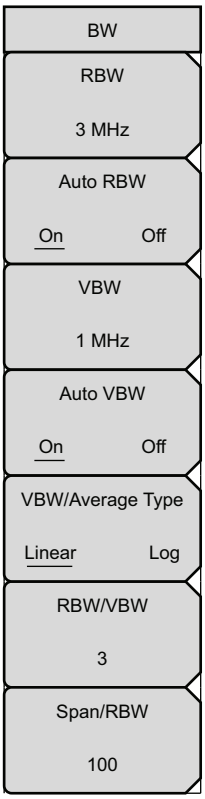
Quasi-peak: When this selection is made resolution bandwidths and video bandwidths of 200 Hz, 9 kHz and 120 kHz are available. This detection method is designed to meet CISPR requirements.

Back: Returns to the “Amplitude Menu” on page 3-37.

Figure 3-32. IA Detection Menu

3-13 BW (Bandwidth) Menu

Key Sequence: **BW**



RBW: 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 begins at 1 Hz and increases in a 1 to 3 sequence from 1 Hz to 3 Hz to 10 Hz, from 10 Hz to 30 Hz to 100 Hz, and so on. To determine the range for your instrument, refer to your Technical Data Sheet.

Auto RBW On/Off: 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: 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 On/Off: 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: Toggles between Linear averaging (arithmetic mean) and Logarithmic averaging (geometric mean).

RBW/VBW: 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.

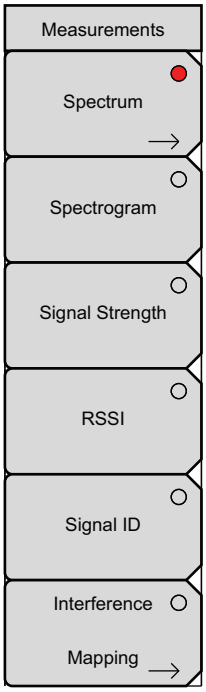
Span/RBW: This submenu key displays the ratio between the span width and the resolution bandwidth. The default value is 100, meaning that the span width is approximately 100 times the resolution bandwidth. The value is approximate because resolution bandwidth filters come in discrete steps while span 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 3-33. IA Bandwidth Menu

3-14 Measurements Menu

Key Sequence: **Measurements**

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



Spectrum: Pressing the Spectrum submenu key sets the instrument to a traditional spectrum analyzer display. When Spectrum is active, pressing the Spectrum submenu key opens a menu for Spectrum Analyzer measurements. See the "[Spectrum] Measure Menu" on page 3-42.

Spectrogram: Pressing the Spectrogram submenu key sets the instrument to display a spectrogram. When Spectrogram is active, pressing the Spectrogram submenu key opens the "Spectrogram Menu" on page 3-59.

Signal Strength: Pressing the Signal Strength submenu key sets the instrument to display signal strength. When Signal Strength is active, pressing the Signal Strength submenu key opens the "Signal Strength Menu" on page 3-60.

RSSI: Pressing the RSSI submenu key sets the instrument to display RSSI (Received Signal Strength Indicator). When RSSI is active, pressing the RSSI submenu key opens the "RSSI Menu" on page 3-61.

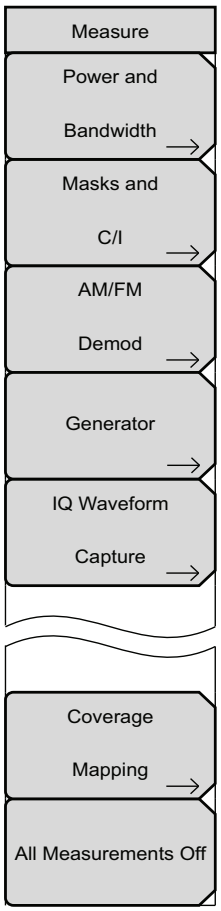
Signal ID: Pressing the Signal ID submenu key opens the "Signal ID Menu" on page 3-62.

Interference Mapping: Pressing the Interference Mapping submenu key opens the "Interference Mapping Menu" on page 3-63.

Figure 3-34. IA Measurement Menu

[Spectrum] Measure Menu

Key Sequence: **Measurements** > Spectrum



Power and Bandwidth: Opens the "Power and BW Menu" on page 3-43.

Masks and C/I: Opens the "Masks and C/I Menu" on page 3-47.

AM/FM Demod: Opens the "AM/FM Demod 1/2 Menu" on page 3-51.

Generator: Opens the "Generator Menu" on page 3-54.

IQ Waveform Capture: Opens the "IQ Waveform Capture Menu (Option 24)" on page 3-55.

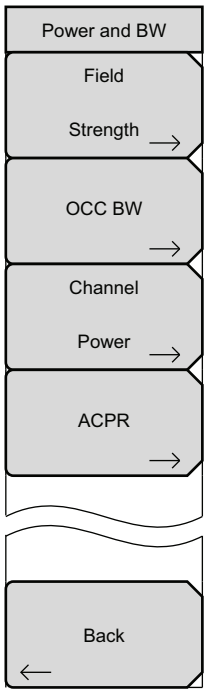
Coverage Mapping: Opens the "Coverage Mapping Menu (Option 431)" on page 3-58.

All Measurements Off: Turns off all measurements.

Figure 3-35. IA Spectrum Measure Menu

Power and BW Menu

Key Sequence: **Measurements** > Spectrum > Power and Bandwidth



Field Strength: Opens the "Field Strength Menu" on page 3-43.

OCC BW: Opens the "OCC BW Menu" on page 3-44.

Channel Power: Opens the "Channel Power Menu" on page 3-45.

ACPR: Opens the "ACPR Menu" on page 3-46.

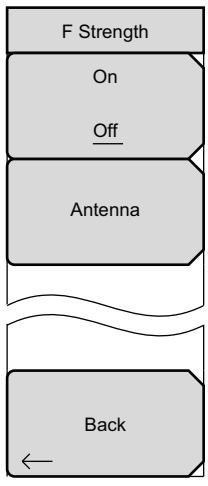
Back: Returns to the "[Spectrum] Measure Menu" on page 3-42 menu.

Figure 3-36. IA Power and BW Menu

Field Strength Menu

Key Sequence: **Measurements** > Spectrum > Power and Bandwidth > Field Strength

This is the same menu as shown in Figure 3-55, "IA Signal Strength Menu" on page 3-60.



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^2, dBV/m, dBmV/m, dBµV/m, Volt/m, Watt/m^2, dBW/m^2, A/m, dBA/m, or Watt/cm^2.

On/Off: Turns Field Strength measurements On or Off.

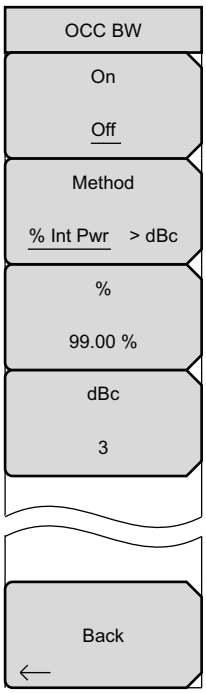
Antenna: This submenu key displays a list box that lists all of the antennas for which the instrument has data, including both standard antennas and custom antennas that have been added by using Master Software Tools. Use the up or down arrow keys or the rotary knob to select the desired antenna and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

Back: Returns to the "Power and BW Menu" on page 3-43.

Figure 3-37. IA Field Strength Menu

OCC BW Menu

Key Sequence: **Measurements** > Spectrum > Power and Bandwidth > OCC BW



On/Off: This submenu key turns the Occupied Bandwidth On or Off.

Method: Select either the % of Internal Power (default) or dB Down measurement method as displayed in the message area. Toggling the setting on this key activates one of the two submenu keys below this key:

% Int Pwr: Use the keypad, the directional arrow keys, or the rotary knob to enter the percent of power, from 0% to 99%.

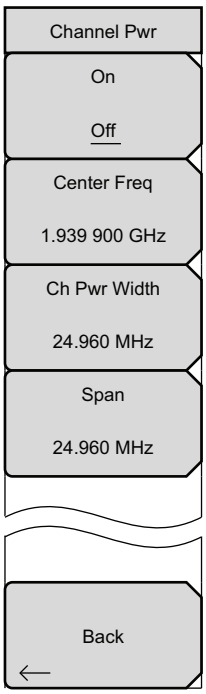
dBc: Use the keypad, the directional arrow keys, or the rotary knob to enter the dBc value (0 dBc to 100 dBc).

Back: Returns to the "Power and BW Menu" on page 3-43.

Figure 3-38. IA OCC BW Menu

Channel Power Menu

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



On/Off: 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 **Shift** and the **Sweep** keys and pressing the Detection submenu key.

Center Freq: 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 up and down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu". The left and right arrows change the frequency by 10% of the span.

Ch Pwr Width: 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 up and down arrow keys change the Channel Power Width by the frequency step value. The left and right arrow keys change the value by 10% of the span.

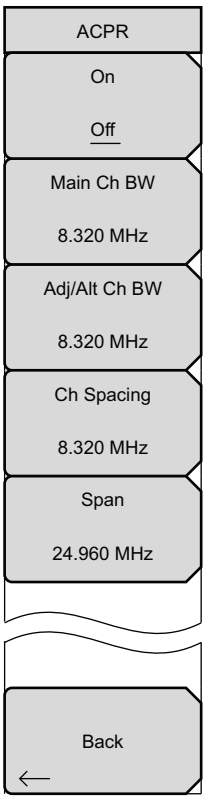
Span: Sets the span for channel power measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.

Back: Returns to the "Power and BW Menu" on page 3-43.

Figure 3-39. IA Channel Power Menu

ACPR Menu

Key Sequence: **Measurements** > Spectrum > Power and Bandwidth > ACPR



On/Off: Begins or ends the ACPR measurement.

Main Ch BW: 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.

Adj/Alt Ch BW: 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.

Ch Spacing: 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 up and down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu". The left and right arrow keys change the value by 10% of the span.

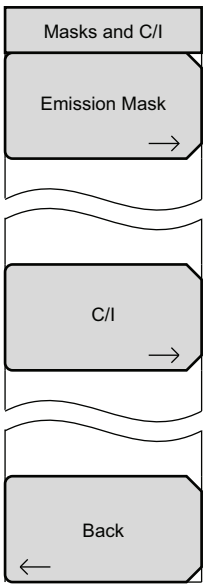
Span: Sets the span for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.

Back: Returns to the "Power and BW Menu" on page 3-43.

Figure 3-40. IA ACPR Menu

Masks and C/I Menu

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



Emission Mask: Opens the "Emission Mask Menu" on page 3-48.

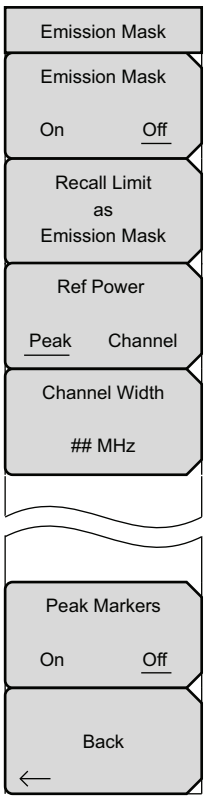
C/I: Opens the "C/I Menu" on page 3-49.

Back: Returns to the "[Spectrum] Measure Menu" on page 3-42.

Figure 3-41. IA Masks and C/I Menu

Emission Mask Menu

Key Sequence: **Measurements** > Spectrum > Masks and C/I > Emission Mask



This submenu controls the setup and display of the emission mask. The emission mask is an upper segmented limit line. It must have more than two nodes, which mean at least two segments. The spectrum emission mask measurement includes the in-band and out-of-band emissions.

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.

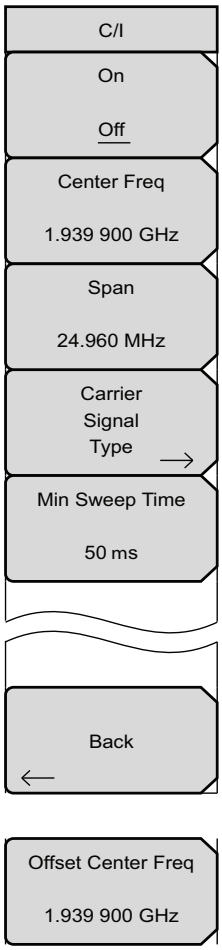
Peak Marker On/Off: Turning on this feature displays a peak marker within an Emission Mask segment. For example, if the Emission Mask had seven segments, then seven peak markers would be displayed. Passing peak markers are light blue in color, while peak markers that exceed the mask limit are red in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

Back: Returns to the "Masks and C/I Menu" on page 3-47.

Figure 3-42. IA Emission Mask Menu

C/I Menu

Key Sequence: **Measurements** > Spectrum > Masks and C/I > 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. The label changes if an offset frequency is entered. Refer to the "Offset Center Freq" key below.

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.

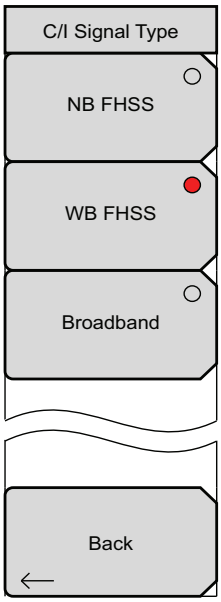
Back: Returns to the "Masks and C/I Menu" on page 3-47.

Offset Center Freq: Submenu key label when a frequency offset has been entered.

Figure 3-43. IA C/I Menu

C/I Signal Type Menu

Key Sequence: **Measurements** > Spectrum > Masks and > C/I > Carrier Signal Type



Carrier Signal Types

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.

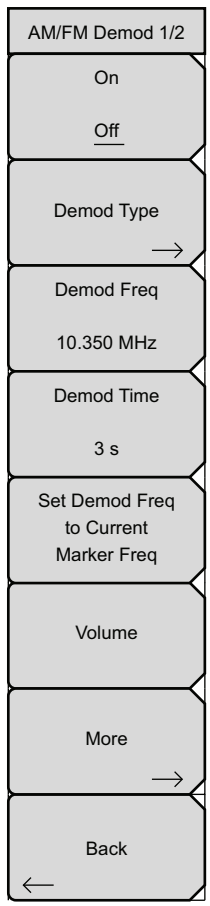
Broadband: Use this setting when the signal being measured is a digital modulation format such as CDMA and GSM.

Back: Returns to the "C/I Menu" on page 3-49.

Figure 3-44. IA C/I Signal Type Menu

AM/FM Demod 1/2 Menu

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



On/Off: Turns AM/FM Demodulation on or off.

Demod Type: Provides submenu keys to select the type of signal to be demodulated (refer to "Demod Type Menu" on page 3-52):

FM Wide Band
FM Narrow Band
AM
USB
LSB

Demod Freq: 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.

Demod Time: Use the keypad, the directional arrow keys, or the rotary knob to increase or decrease the demodulation time, and press the **Enter** key to select. The demodulation time can be set from 100 milliseconds to 500 seconds. The instrument sweeps one time for every demodulation period. Sweeping pauses during the demodulation time.

Set Demod Freq to Current Marker Freq: Sets the demodulation frequency to the frequency of the current marker.

Beat Freq Osc: 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.

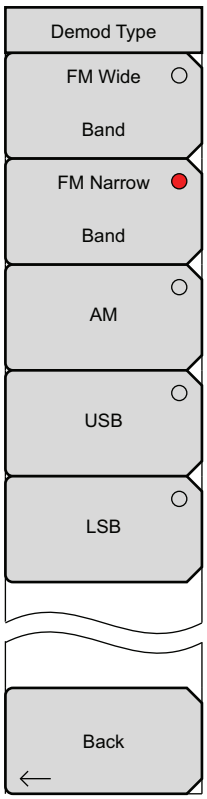
Volume: The current volume setting is displayed on the screen. Use the up or down arrow keys or rotary knob to change the volume, and press the **Enter** key to select.

Back: Returns to the "[Spectrum] Measure Menu" on page 3-42.

Figure 3-45. IA AM/FM Demod Menu

Demod Type Menu

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



Press one of these submenu keys to select an AM/FM demodulation type. The red circle indicates the active selection. This menu provides five choices for the type of signal to be demodulated.

FM Wide Band: Frequency Modulation

FM Narrow Band: Frequency Modulation

AM: Amplitude Modulation

USB: Upper Sideband. This can also be used when demodulating CW (Morse code) signals.

LSB: Lower Sideband. This can also be used when demodulating CW (Morse code) signals.

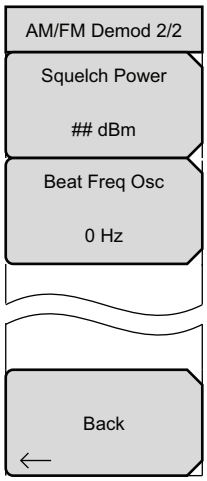
Back: Returns to the "AM/FM Demod 1/2 Menu" on page 3-51.

Figure 3-46. IA Demod Type Menu

Refer to Section 2-19 "AM/FM/SSB Demodulation" on page 2-22 for a description of the built-in demodulator.

AM/FM Demod 2/2 (More) Menu

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



Squelch Power: Sets the squelch power value. Use this setting to limit noise when there is no signal to demodulate. The squelch value is the limit below which no signal is demodulated.

Beat Freq Osc: Sets the beat frequency of the oscillator to exactly set the demodulation frequency of USB and LSB signals. Displayed only when USB or LSB is selected as the Demod Type. This can also be used when demodulating CW (Morse code) signals.

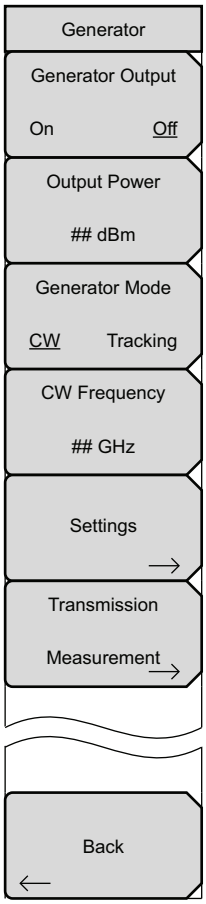
Back: Returns to the "AM/FM Demod 1/2 Menu" on page 3-51.

Figure 3-47. IA AM/FM Demod 2/2 Menu

Generator Menu

Key Sequence: **Measurements** > Spectrum > Generator

This menu is available only in spectrum analyzers with a Tracking Generator option.



Generator Output
On Off: Turns the Tracking Generator Option on and off.

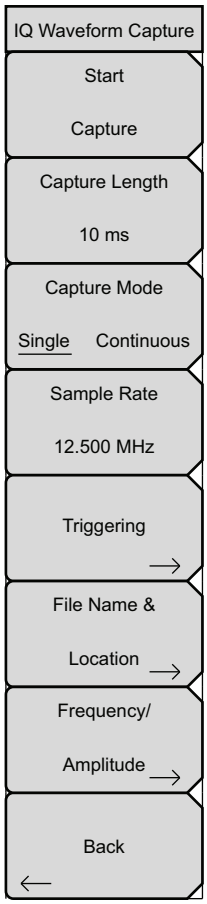
For more information about the Tracking Generator, refer to the Tracking Generator Measurement Guide, Anritsu part number 10580-00339.

Back: Returns to the "[Spectrum] Measure Menu" on page 3-42.

Figure 3-48. IA Generator Menu

IQ Waveform Capture Menu (Option 24)

Key Sequence: **Measurements** > Spectrum > IQ Waveform Capture



Start Capture: Initiates a capture using the current settings. Messages will appear on screen to notify the user of progress and the filename of the data acquired after the waveform capture is complete (Figure 2-13). If Capture Mode is set to Continuous, this button becomes the Stop Capture button. Press the Stop Capture button to end a continuous waveform capture.

Capture Length: Sets the time length of the capture.

Capture Mode: When set to “single”, the unit will perform 1 waveform capture each time “Start Capture” is pressed. When set to “continuous”, the instrument will begin a new capture as soon as the previous one is finished.

Sample Rate: Opens the Select Capture Sample Rate dialog (Figure 2-12). Select the desired Sample Rate (MHz) and associated Bandwidth (MHz) and then press **Enter**.

Triggering: Opens the “IQ Capture Triggering Menu” on page 3-56 to set the triggering parameters.

File Name & Location: Opens the “IQ Capture Save Menu” on page 3-56 to set the directory location of the saved file and the prefix of the file name.

Frequency/Amplitude: Opens the “IQ Capture Frequency/Amplitude Menu” on page 3-57 which contains the specific buttons for setting up the capture waveform frequency, display and attenuation parameters.

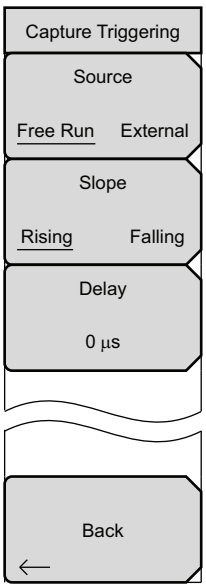
Back: Returns to the “[Spectrum] Measure Menu” on page 3-42.

Figure 3-49. IA IQ Waveform Capture Menu

This menu and its submenu key within the Measure menu are displayed only when Option 24 is installed on your instrument.

IQ Capture Triggering Menu

Key Sequence: **Measurements** > Spectrum > IQ Waveform Capture > Triggering



Source: Press this submenu key to set the desired type of triggering.

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 after the set delay. After the sweep is complete, the resultant trace is displayed until the next trigger signal arrives.

Slope: Sets the trigger slope to rising or falling.

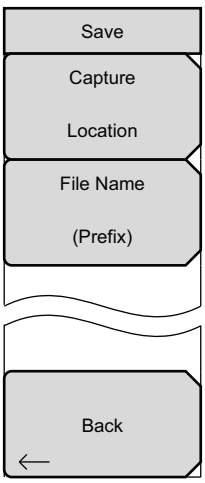
Delay: Used when External is selected for the Source. Capture begins after set time delay, once the trigger has occurred. The delay can be entered either as a percentage of the sweep time or as an absolute time delay with units of ns, µs, or ms.

Back: Returns to the "IQ Waveform Capture Menu (Option 24)" on page 3-55.

Figure 3-50. IA IQ Capture Triggering Menu

IQ Capture Save Menu

Key Sequence: **Measurements** > Spectrum > IQ Waveform Capture > File Name & Location



Capture Location: Opens the Select Save Location dialog and Save Location menu. Refer to the instrument's User Guide, under File Menu Overview in section Save Location menu for additional information.

Filename (Prefix): Allows changing the prefix of the output file. Files are saved with a running counter appended to this prefix. Its extension is `*.wcap`. For example: CaptureOut0045.wcap. CaptureOut is the set prefix file name, and 0045 is the counter number appended to the prefix.

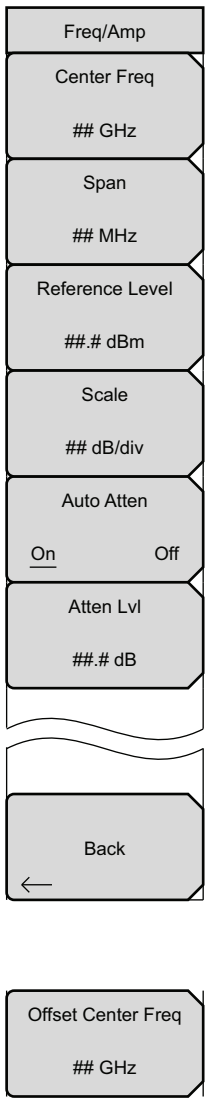
Pressing File Name (Prefix) opens the Edit Filename Prefix dialog and Save menu. The waveform capture output file is a combination of XML and binary data. The beginning of the file contains all of the capture-related parameters such as center frequency, bandwidth, and capture rate as well as any contextual information about the file, such as time, date, and GPS location (if available). At the bottom of the file, in between the <Data> tags, is the raw I and Q data in binary form. I and Q data points are each 3 bytes long and stored in 24-bit twos complement in an alternating fashion (in other words, I0, Q0, I1, Q1…).

Back: Returns to the "IQ Waveform Capture Menu (Option 24)" on page 3-55.

Figure 3-51. IA IQ Capture Save Menu

IQ Capture Frequency/Amplitude Menu

Key Sequence: **Measurements** > Spectrum > IQ Waveform Capture > Frequency/Amplitude



Center Freq: Press this 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 effect as the MHz submenu key. With zero offset, this key displays the title **Center Freq**. With an offset other than zero, this key displays the title **Offset Center Freq**, as shown below the full menu. Refer to Section 3-11 “Frequency Menu with Offset Function” on page 3-33.

Span: Lets you set the frequency span to be displayed on the instrument. 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.

Reference Level: The reference level is the top grid line on the display and can be set from +30 dBm to –150 dBm. A value may be entered from the keypad, use the ± key for a minus sign. After entering the value press the dBm submenu key or the **Enter** key. The up or down arrow keys change the reference level in 10 dB steps, and the left or right 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.

Scale: The y-axis 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.

Auto Atten: 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.

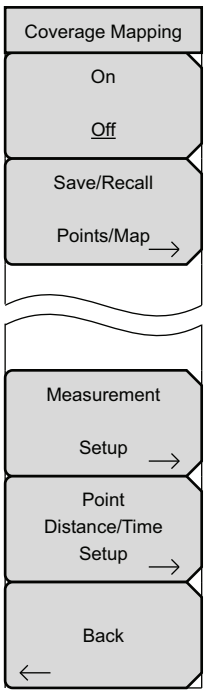
Atten Level: Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.

Back: Returns to the “IQ Waveform Capture Menu (Option 24)” on page 3-55.

Figure 3-52. IA IQ Capture Freq/Amp Menu

Coverage Mapping Menu (Option 431)

Key Sequence: **Measurements** > Spectrum > Coverage Mapping



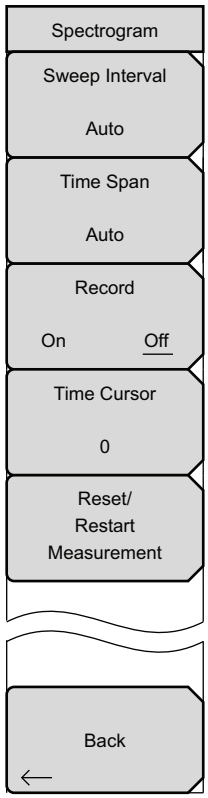
Coverage Mapping
On Off: Turns Coverage Mapping on and off. Refer to Chapter 6, “Coverage Mapping”.

Back: Returns to the “[Spectrum] Measure Menu” on page 3-42.

Figure 3-53. Coverage Mapping Menu

Spectrogram Menu

Key Sequence: **Measurements** > Spectrogram



Sweep Interval: Press the Sweep Interval submenu key and use the rotary knob or keypad to set the time from 0 seconds to 60 seconds.

Time Span: 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.

Record: 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.

Record: 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: 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 or 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.

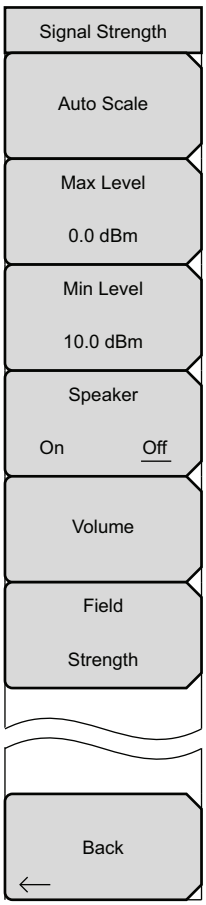
Reset/Restart Measurement: Pressing this key will clear the captured spectrogram display and start a new series of measurements.

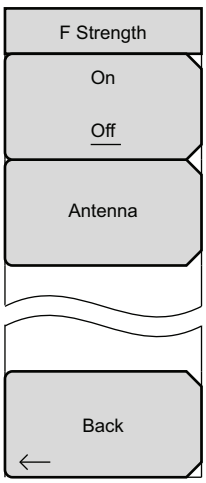
Back: Returns to the “Measurements Menu” on page 3-41.

Figure 3-54. 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 or 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^2, dBV/m, dBmV/m, dBµV/m, Volt/m, Watts/m^2, dBW/m^2, A/m, dBA/m, or Watt/cm^2.

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

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

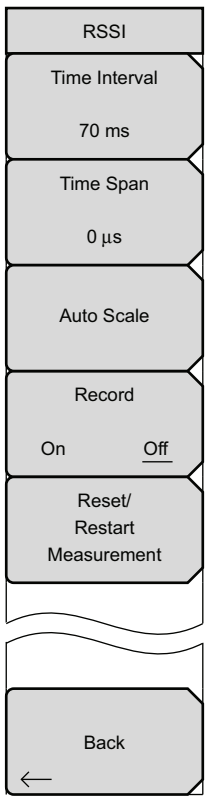
Back: Returns to the Signal Strength menu.

Back: Returns to the "Measurements Menu" on page 3-41.

Figure 3-55. IA Signal Strength Menu

RSSI Menu

Key Sequence: **Measurements** > RSSI



Time Interval: 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.

Time Span: 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.

Auto Scale: Press the Auto Scale submenu key to automatically set the reference level and scale factor to place the trace on the screen.

Record On/Off: 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 (**File** > Recall).

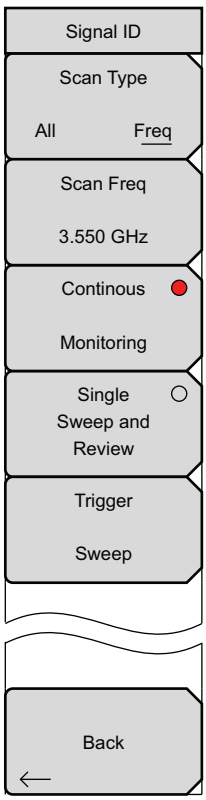
Reset/Restart Measurement: Resets or Restarts the measurement. The RSSI trace is erased and begins anew at the right side of the display.

Back: Returns to the “Measurements Menu” on page 3-41.

Figure 3-56. IA RSSI Menu

Signal ID Menu

Key Sequence: **Measurements** > Signal ID



Scan Type: The Signal ID feature in the Interference Analyzer can help to quickly identify types of the interfering signals.

All: Identifies all frequencies within the designated span.

Freq: Displays the signal data for the selected scan frequency in the Signal ID Results window.

Scan Freq: Press this submenu key to enter manually a desired center frequency for monitoring.

Continuous Monitoring: Press this submenu key to continuously sweep across the start and stop frequencies, entered frequency span, or scan frequency.

Single Sweep and Review: 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.

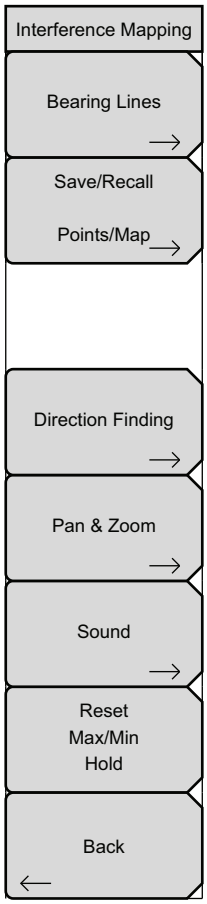
Trigger Sweep: Press this submenu key to trigger another sweep when the Single Sweep and Review submenu key is activated.

Back: Returns to the “Measurements Menu” on page 3-41.

Figure 3-57. IA Signal ID Menu

Interference Mapping Menu

Key Sequence: **Measurements** > Interference Mapping



Bearing Lines: Opens the "Bearing Lines Menu" on page 3-64.

Save/Recall Points/Map: Opens the "Mapping Save/Recall Menu" on page 3-65.

Direction Finding: Opens the "Direction Finding Menu" on page 3-66 to setup the MA2700 Handheld Interference Hunter.

Pan & Zoom: Opens the "Pan & Zoom Menu" on page 3-67 for moving throughout the map.

Sound: Opens the "DF Sound Settings Menu" on page 3-68 for setting the instrument's audio.

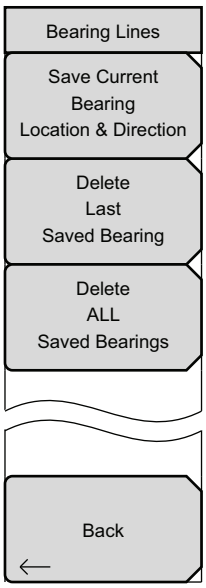
Reset Max/Min Hold: The lower and upper limit in the graph are adjusted and updated continuously to display the highest and lowest values. Press this button to reset the Max and Min values.

Back: Returns to the "Measurements Menu" on page 3-41.

Figure 3-58. IA Interference Mapping Menu

Bearing Lines Menu

Key Sequence: **Measurements** > Interference Mapping > Bearing Lines



Save Current Bearing Location & Direction: Records a bearing line on the display, starting from the instruments current location, based on GPS. Functions like the trigger on the MA2700.

Delete Last Saved Bearing: Press this button to delete the last bearing line from memory. The bearing line will also be removed from the map. This may be repeated to delete more than one measurement.

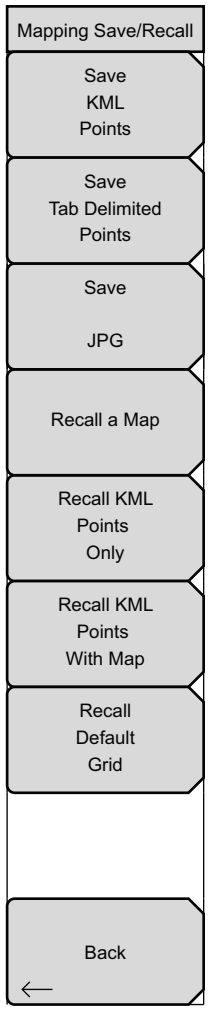
Delete All Saved Bearings: Press this button to remove all of the bearing lines from the screen and memory.

Back: Returns to the "Interference Mapping Menu" on page 3-63.

Figure 3-59. IA Bearing Lines Menu

Mapping Save/Recall Menu

Key Sequence: **Measurements** > Interference Mapping > Save/Recall Points/Map



Save KML Points: 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: Press this button to save the points in a tab delimited text file. FileName.mtd will be stored in the selected location.

Save JPG: Press the Save JPG key to save a JPG file of the current display.

Recall a Map: Opens the Recall menu for selecting a map created with the Anritsu easyMap Tools to display on the screen.

Recall KML Points Only: Opens the Recall menu for selecting a .kml file. Displays the saved point locations and directions overlaid on the current map, which could be the default grid or any previously recalled map.

Recall KML Points With Map: 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 the saved point locations and directions overlaid on top of a map.

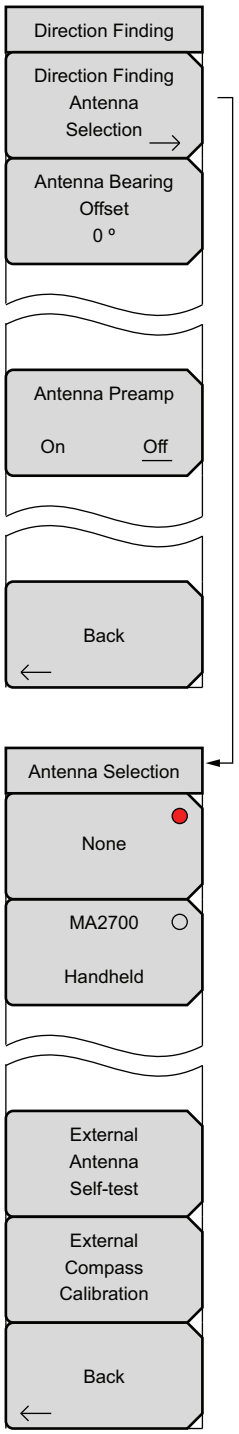
Recall Default Grid: If you do not have a GPS embedded map but are out in the field making measurements and would like to save the KML points, the Recall Default Grid submenu key allows you to save the points and the corresponding GPS coordinates to view at a later time.

Back: Returns to the "Interference Mapping Menu" on page 3-63.

Figure 3-60. IA Mapping Save/Recall Menu

Direction Finding Menu

Key Sequence: **Measurements** > Interference Mapping > Direction Finding



Direction Finding Antenna Selection: Opens the Antenna Selection submenu for selecting the directional antenna, running an external antenna self-test, and running an external compass calibration.

None: When the MA2700 is not connected, the instrument will automatically default to this setting.

MA2700 Handheld: Press this button when using the MA2700 Handheld Interference Hunter for interference hunting.

External Antenna Self-test: Press to run the external Antenna Self-Test. The MA2700 Self-test dialog opens and runs various power tests, link tests, and a Serial Flash test. Pressing **Esc** or touching the display removes the test window from the display.

External Compass Calibration: Opens the Compass Calibration menu and the calibration display screen. Follow the onscreen instructions.

Back: Returns to the Direction Finding menu.

Antenna Bearing Offset: Adjusts the antenna bearing line in the same direction as the directional antenna.

Press the button and enter a value between -180 and 180 then select the direction of the offset by pressing either the Degrees Clockwise terminator button or the Degrees Counter-clockwise terminator button.

Note: Clockwise is from the top (0°) to the right (90°), then down (180 or -180), and then to the left (-90°), and back up to the top.

This allows the user to:

- Correcting for local magnetic anomalies that are not accounted for in the True North from Magnetic North correction.
- Use an antenna null, rather than the main lobe.
- Using an antenna where the main lobe doesn't point in the same direction as the MA2700.

Antenna Preamp On Off: When set to On the preamplifier for the MA2700 in active and the firmware will attempt to turn on the instrument's preamp based on current instrument settings. When set to Off the MA2700 preamp is bypassed and the instrument's preamp is turned off.

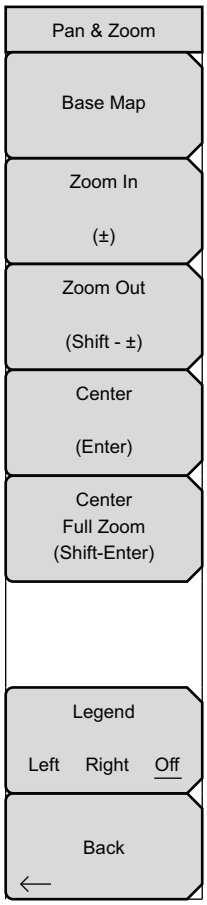
Note: The instrument preamp can be turned on and off independent of the MA2700 preamp. Refer to "Amplitude Menu" on page 3-37.

Back: Returns to the "Interference Mapping Menu" on page 3-63.

Figure 3-61. IA Direction Finding Menu

Pan & Zoom Menu

Key Sequence: **Measurements** > Interference Mapping > Pan & Zoom



Base Map: Press this button to view the full map.

Zoom In (±): Press this button to zoom in one map panel at a time. Pressing the (+/-) keypad button does the same as long as a parameter is not being adjusted.

Zoom Out (Shift - ±): Press this button to zoom out one map panel at a time. Pressing the Shift and (+/-) keypad buttons once does the same as long as a parameter is not being adjusted.

Center (Enter): Press this button to center the panel in which the Handheld Interference Hunter is located. Pressing the **Enter** keypad button does the same as long as a parameter is not being adjusted.

Center Full Zoom (Shift - Enter): Brings the map panel where the Handheld Interference Hunter is currently located into the display. Pressing the **Shift** and **Enter** keypad button does the same as long as a parameter is not being adjusted. Note that the current location may not be exactly centered on the display.

Legend Left Right Off: When displaying an AZM map, a legend can be displayed the top left or top right corner of the map. The legend consists of a column bar, a square which represents the current location and base map, and several status icons (Figure 3-63). The column bar indicates the number of levels of zoom in the AZM map with the darkened rectangle at the current level of zoom. If there are five levels of zooms, then there will be five rectangles in the column. A darkened rectangle at the bottom of the column indicates the lowest level of zoom while a darkened rectangle at the top of the column indicates the highest level of zoom.

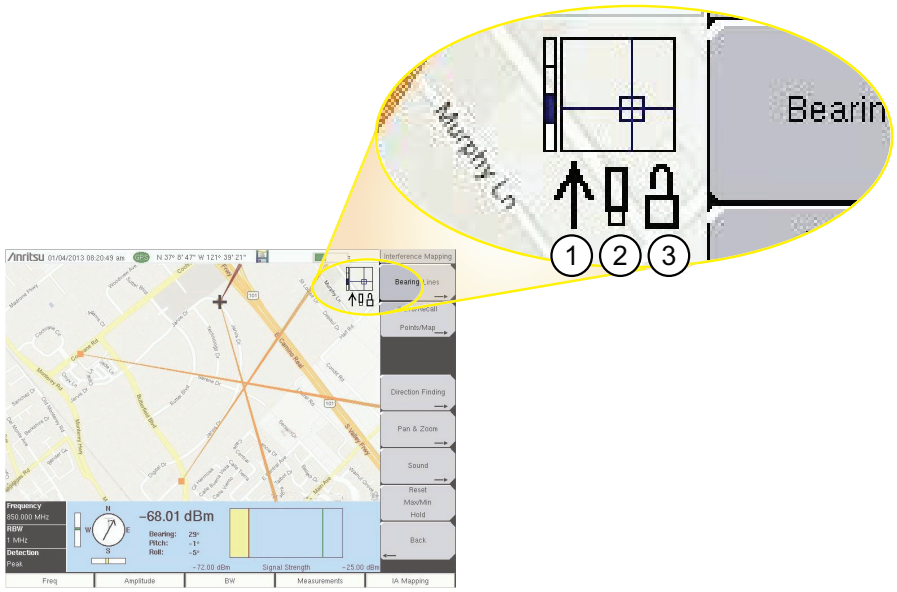
The default square with crosshair represents a map panel with the lowest zoom. The crosshair is at the center of that panel. As the zoom level increases a boundary of a panel is displayed around the crosshair. The higher the zoom level, the smaller the square around the crosshair. When panning through the map (using the Instrument's arrow keys), the crosshair and map panel boundary displays your relative location of the total mapped area.

When the lock is 'locked' (by pressing **Enter**), the map is in auto-centering mode, meaning that if you walk or drive around, the map will change to show your current position. If you pan (using the arrow keys), the map is taken out of auto-centering (unlocked), as you have intentionally moved away from your current location. When unlocked you can move around and the map will not follow you.

After panning, press the **Enter** key to re-center and re-lock the mode.

Back: Returns to the "Interference Mapping Menu" on page 3-63.

Figure 3-62. IA Pan & Zoom Menu

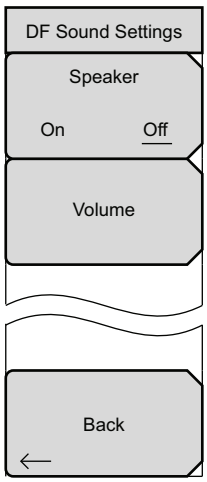


1	MA2700 USB cable is connected and recognized by the Anritsu instrument.
2	USB memory stick is available for data read/write.
3	.azm map auto-centering mode (locked/unlocked). When “locked” the instrument automatically displays the map tile at current zoom level which best centers the current GPS location. The instrument will attempt to swap map tiles as the GPS location changes to continue displaying the current location near the center of the screen.

Figure 3-63. Map Legend Status Indicators

DF Sound Settings Menu

Key Sequence: **Measurements** > Interference Mapping > Sound



Speaker On Off: Sounds a tone based on received signal strength. Off mutes the speaker.

Volume: Adjust the volume when the Speaker submenu key is On.

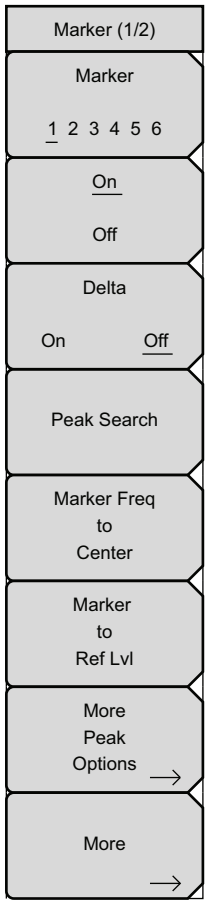
Back: Returns to the “Interference Mapping Menu” on page 3-63.

Figure 3-64. IA Pan & Zoom 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: Selects the active marker (1 to 6). The underlined marker number is the active marker.

On/Off: Turns the selected marker underlined in the Marker key On or Off.

Delta On/Off: Turns on a delta marker and prompts for a delta offset frequency, either positive or negative from the frequency of the currently active marker.

Peak Search: This key places the currently active marker on the highest signal amplitude currently displayed on screen.

Marker Freq to Center: Moves the frequency noted by the active marker to the center frequency position and center of the display.

Marker to Ref Level: Causes the amplitude of the currently active marker to become the reference level, which is the top horizontal line of the display.

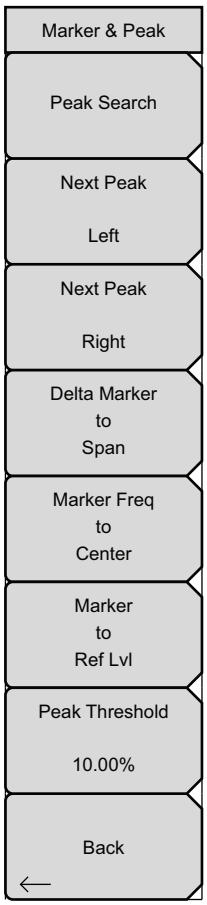
More Peak Options: Brings up a secondary menu of submenu keys for more peak searching options. See the "Marker and Peak Options Menu" on page 3-70.

More: Opens a submenu of additional Marker options. See the "Marker 2/2 Menu" on page 3-71.

Figure 3-65. IA Marker (1/2) Menu

Marker and Peak Options Menu

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



Peak Search: Places the currently active marker on the highest amplitude signal currently on screen.

Next Peak Left: 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: 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: 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: Sets the center frequency to the frequency of the currently active marker.

Marker to Ref Lvl: Sets the reference level (top grid line) to the amplitude of the currently active marker.

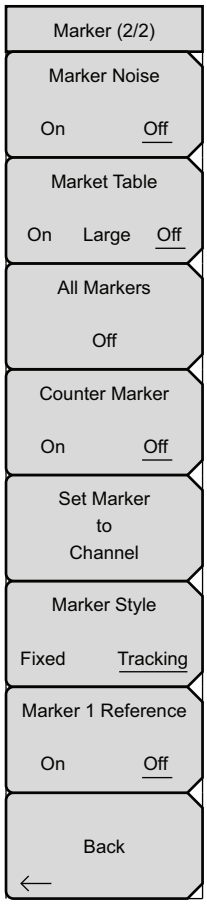
Peak Threshold: Allows the user to specify how far above the average noise floor a signal must rise before it is considered a peak.

Back: Returns to the “Marker Menu” on page 3-69.

Figure 3-66. IA Marker & Peak Menu

Marker 2/2 Menu

Key Sequence: **Marker >** More



Marker Noise On/Off: 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/Off: 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: Turns off all markers.

Counter Marker On/Off: 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: 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.

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.

Marker Style: 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.

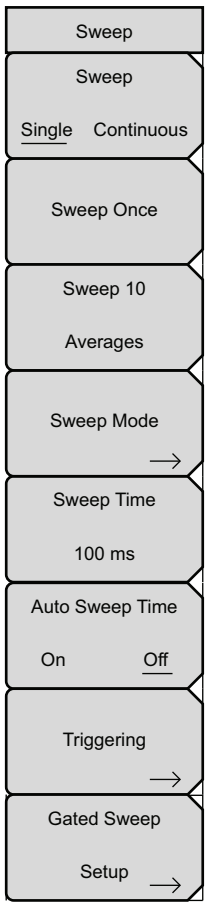
Marker 1 Reference: Selects whether Marker 1 is the reference for all six delta markers, or whether each of the six reference markers has an associated delta marker.

Back: Returns to the “Marker Menu” on page 3-69.

Figure 3-67. IA Marker 2/2 Menu

3-16 Sweep Menu

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



Sweep Single/Continuous: This submenu key toggles between continuous sweep and single sweep. In single sweep mode, the results of a sweep are displayed on the screen while the instrument awaits a trigger event to start a new sweep.

Sweep Once: 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 # Averages: Sweeps the number of times set using the # of Averages button under the Trace A Ops menu. Trace A must be set to Averaging (**Shift** > **Trace** (**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 Mode (Only available on some models)**:** Pressing this submenu key opens the "Sweep Mode Menu" on page 3-73.

Sweep Time: Sets the sweep time for the measurement. This submenu key is replaced by a **Zero Span Time** submenu key when the analyzer is set to Zero Span.

Auto Sweep Time: 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.

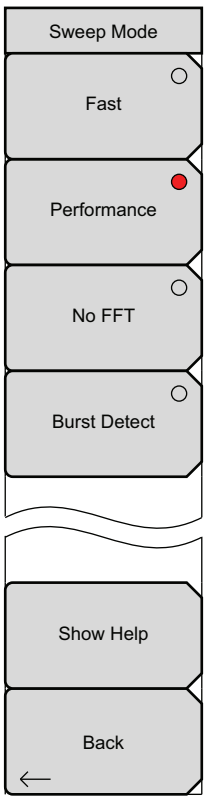
Triggering: Functional in Zero span only. Displays the "Triggering Menu" on page 3-74.

Gated Sweep Setup (Option 90 Only)**:** For configuring Gated Sweep. Opens the "Gated Sweep Menu (Option 90)" on page 3-76.

Figure 3-68. IA Sweep Menu

Sweep Mode Menu

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



This menu sets the current sweep mode. Select one of the four Sweep Mode options.

Fast: Fastest sweep speed.

Performance: Provides best amplitude accuracy and ensures all specifications are met.

No FFT: Slowest sweep speed. Ideal for analog and pulse modulated signals.

Burst Detect: Press to view narrow pulsed signals.

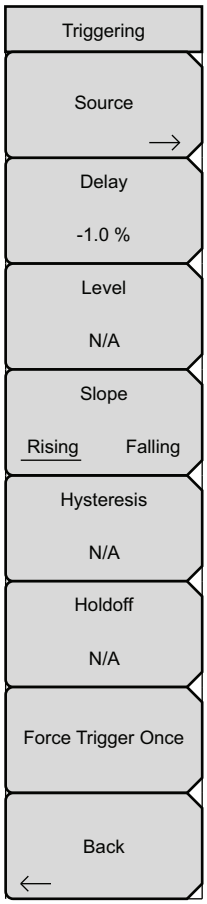
Show Help: Display a table showing the merits and tradeoffs of the three Sweep Mode settings.

Back: Returns to the "Sweep Menu" on page 3-72.

Figure 3-69. IA Sweep Mode Menu

Triggering Menu

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



Source: Displays the "Triggering Source Menu" on page 3-75.

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, µs or ms.

A negative delay displays the trigger position on screen, while a positive value places the trigger point off the screen to the left.

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.

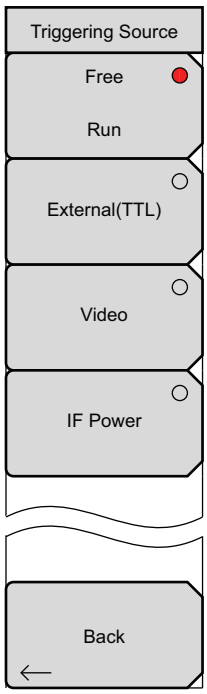
Force Trigger Once: Forces a sweep regardless of meeting any trigger criteria.

Back: Returns to the "Sweep Menu" on page 3-72.

Figure 3-70. IA Triggering Menu

Triggering Source Menu

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



This menu provides four choices for the triggering source.

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, then no trace will be displayed on the screen. This mode is used in Zero Span.

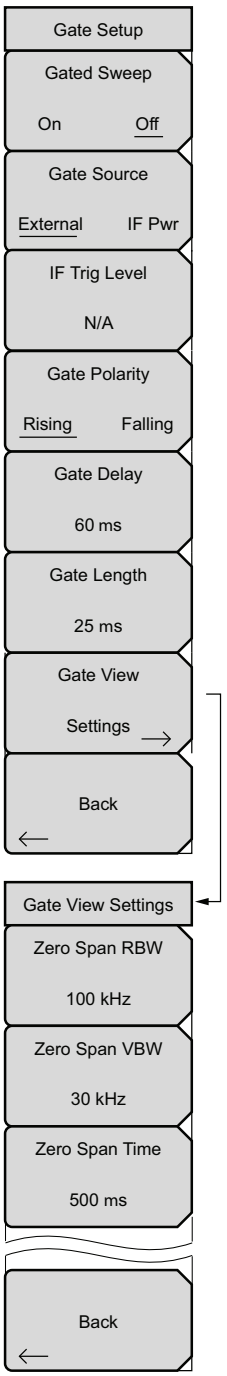
IF Power: This mode is used in zero span to use IF power level as the trigger source. The power level can be set (using the Level submenu key) from –130 dBm to +30 dBm, using the rotary knob, arrow keys, or keypad. The trigger is based on the measured signal level. If no signal reaches or exceeds the trigger level, then no trace will be on the screen.

Back: Returns to the “Triggering Menu” on page 3-74.

Figure 3-71. IA Triggering Source Menu

Gated Sweep Menu (Option 90)

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



Gated Sweep: Turns the Gated Sweep function On and Off.

Gate Source: Gate Source is currently only available using an External trigger signal that can be input using the instrument's Ext Trigger In connector.

Gate Polarity Rising/Falling: Press to select the desired edge trigger to begin the gated sweep.

Gate Delay: Sets the start of the gated sweep indicated by the left border of the blue dashed rectangle shown in the bottom graph of Figure 2-3 on page 2-8.

Gate Length: Sets the length of the gate and is reflected on the zero span graph by the width of the blue rectangle as shown in Figure 2-3.

Gate View Settings: 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).

Zero Span RBW: Sets the resolution bandwidth of the zero span graph.

Zero Span VBW: Sets the video bandwidth of the zero span graph.

Zero Span Time: Sets the sweep time of the zero span graph.

Back: Returns to the Gate Setup menu.

Back: Returns to the "Sweep Menu" on page 3-72 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.

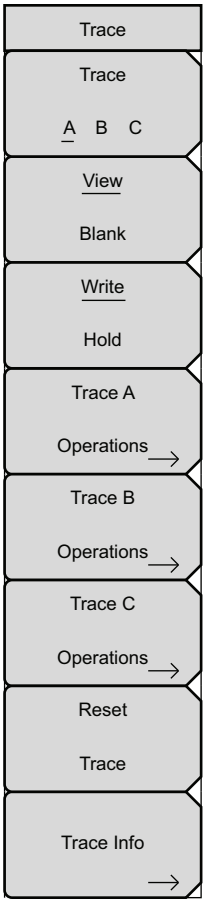
Figure 3-72. IA Gated Sweep Menu

3-17 Trace Menu

Key Sequence: **Shift** > **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.

Note	This menu is active only when making Spectrum measurements. The key sequence is not operational when Spectogram, Signal Strength, RSSI, Signal ID, or Interference Mapping measurements are active.



Trace A, B, C: 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.

View/Blank: Displays or hides the active trace.

Write/Hold: 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.

Trace A Operations: Lists the Trace A Ops menu to select an operation that can be applied to Trace A. See "Trace A Ops Menu" on page 3-78.

Trace B Operations: Lists the Trace B Ops menu to select an operation that can be applied to Trace B. See "Trace B Ops Menu" on page 3-79.

Trace C Operations: Lists the Trace C Ops menu to select an operation that can be applied to Trace C. See "Trace C Ops Menu" on page 3-80.

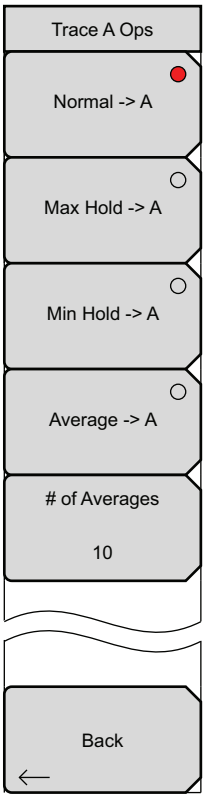
Reset Trace: Resets the trace averaging, Max Hold and Min Hold, and restarts the sweep.

Trace Info: Stops the current trace and displays a summary table of trace parameters and current settings. Press **Enter** to clear the table from the display and restart the trace.

Figure 3-73. 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.

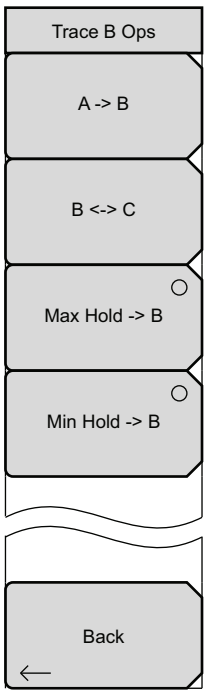
# of Averages: Sets the number of traces for use in calculating the average display value. Then number used for averaging ranges from 1 to 65535.

Back: Returns to the "Trace Menu" on page 3-77.

Figure 3-74. IA Trace A Ops Menu

Trace B Ops Menu

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



A -> B: Copies the contents of Trace A into Trace B. Doing so overwrites the previous contents of Trace B.

B <--> C: Swaps the contents of Traces B and C.

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

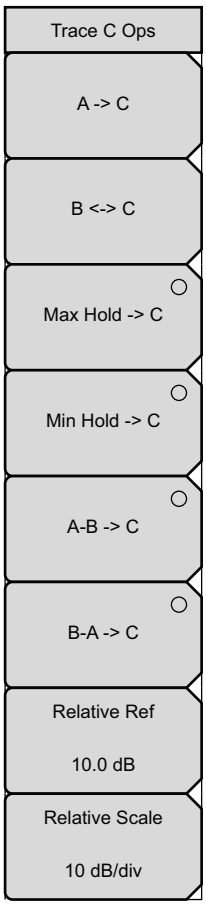
Min Hold -> B: Shows the cumulative minimum value of each display point over many trace sweeps.

Back: Returns to the "Trace Menu" on page 3-77.

Figure 3-75. IA Trace B Ops Menu

Trace C Ops Menu

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



A -> C: Copies the contents of Trace A into Trace C. Doing so overwrites the previous contents of Trace C.

B <--> C: Swaps the contents of Traces B and C.

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

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

A - B -> C: 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.

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: 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: Sets the value applied to the top grid line 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, up or down arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the **Enter** key. This entry is valid only when trace math is active.

Relative Scale: 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, up or down arrows, or entering the value on the numeric keypad and pressing the dB submenu key or the **Enter** key. This entry is valid only when trace math is active.

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

Figure 3-76. IA Trace C Ops Menu

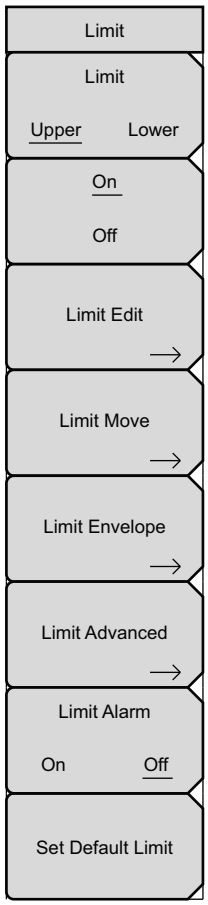
3-18 Limit Menu

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 3-77). 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. Refer to your User Guide for details.

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

Note	This menu is active only when making Spectrum measurements. The key sequence is not operational when Spectogram, Signal Strength, RSSI, Signal ID, or Interference Mapping measurements are active.



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 "[Limit] Edit Menu" on page 3-82 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 3-84.

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 3-82 for an example limit envelope. Press this submenu key to open the "Limit Envelope Menu" on page 3-85.

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 3-87.

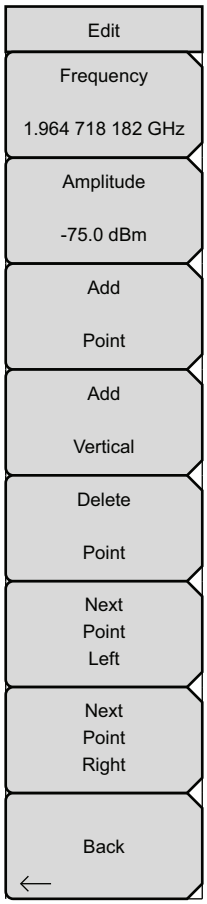
Limit Alarm On/Off: Pressing this submenu key toggles the alarm function ON and OFF for the currently active limit line. When ON, an alarm beep will occur when a data point exceeds the limit.

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 3-77. IA Limit Menu

[Limit] Edit Menu

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



Frequency: 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 left or right arrow keys, or the rotary knob to change the frequency of an inflection point. The left or right arrows move the inflection point by 5% of the span.

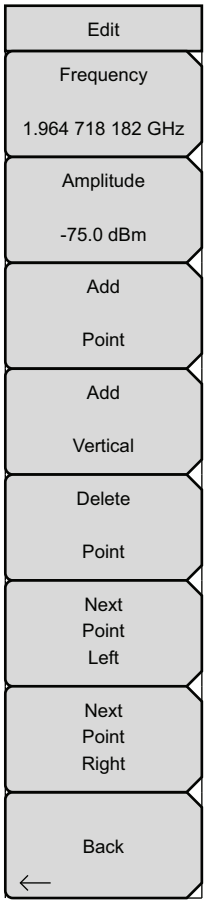
Amplitude: Press this submenu key to set the amplitude of a limit line inflection point. The amplitude of each inflection point can also be individually set. By default, when a new point is added, it takes on the amplitude that is on the limit line at the frequency where the point was added. Use the keypad (using the ± key to set a negative value), the up or down 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 up or down arrows move the amplitude by 5% of the screen height.

Add Point: 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 –30 dBm, and if the next point is 3.0 GHz with an amplitude of –50 dBm, then the added point will be at 2.5 GHz with an amplitude of –40 dBm. The frequency and amplitude values of the new point can be adjusted as needed with the Frequency and Amplitude submenu keys.

If the last limit point is active (assuming it is not at the right edge of the display), 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.

Figure 3-78. IA Limit Edit Menu (1 of 2)

[Limit] Edit Menu (Continued)



Add Vertical: 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.

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.

Delete Point: 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.

Next Point Left: 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.

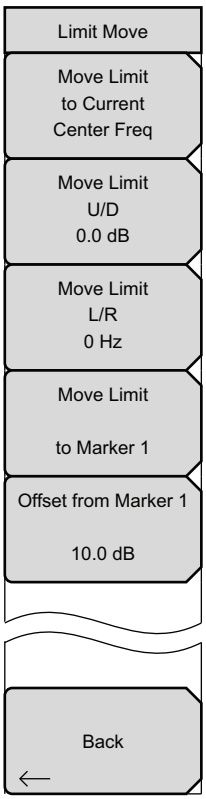
Next Point Right: Press this submenu key to select the limit point immediately to the right of the active point, making this newly selected point active for editing or deletion. With each key press, the active point becomes that point to the right of the previously active point, until the newly selected active point becomes the right-most point on the screen.

Back: Press this submenu key to return to the “Limit Menu” on page 3-81.

Figure 3-79. IA Limit Edit Menu (2 of 2)

Limit Move Menu

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



Move Limit to Current Center Freq: 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 ## dB: 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 up and down arrows move the limit line by 5% of the screen height. The left and right 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 ## Hz: 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 left or right arrows move the limit line by 5% of the span while the up or down arrows move the line by one display pixel.

Move Limit to Marker 1: 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).

Offset from Marker 1 ## dB: 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: Press this submenu key to return to the “Limit Menu” on page 3-81.

Figure 3-80. IA Limit Move Menu

Limit Envelope Menu

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

Create Envelope: 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.

Update Envelope Amplitude: 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.

Upper Points (if Upper Limit is selected)
Lower Points (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.

Upper Offset (if Limit is toggled to Upper)
Lower Offset (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 ±100 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.

Upper Shape (if Limit is toggled to Upper)
Lower Shape (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. Figure 3-82 is an example of a Square Limit Envelope.

Back: Press this submenu key to return to the “Limit Menu” on page 3-81.

Figure 3-81. IA Limit Envelope Menu

Square Limit Envelope Example

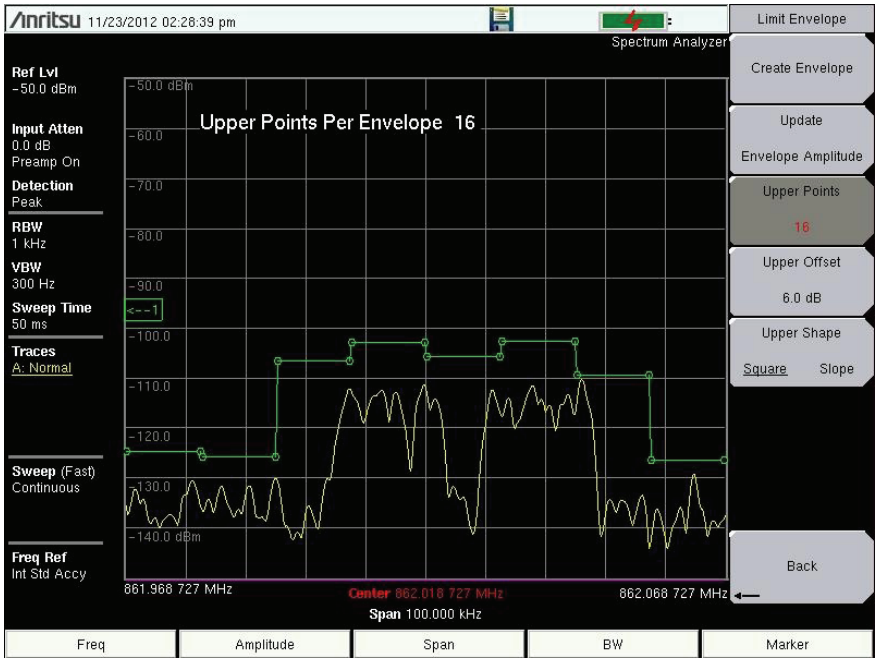


Figure 3-82. Square Limit Envelope

Sloped Limit Envelope Example

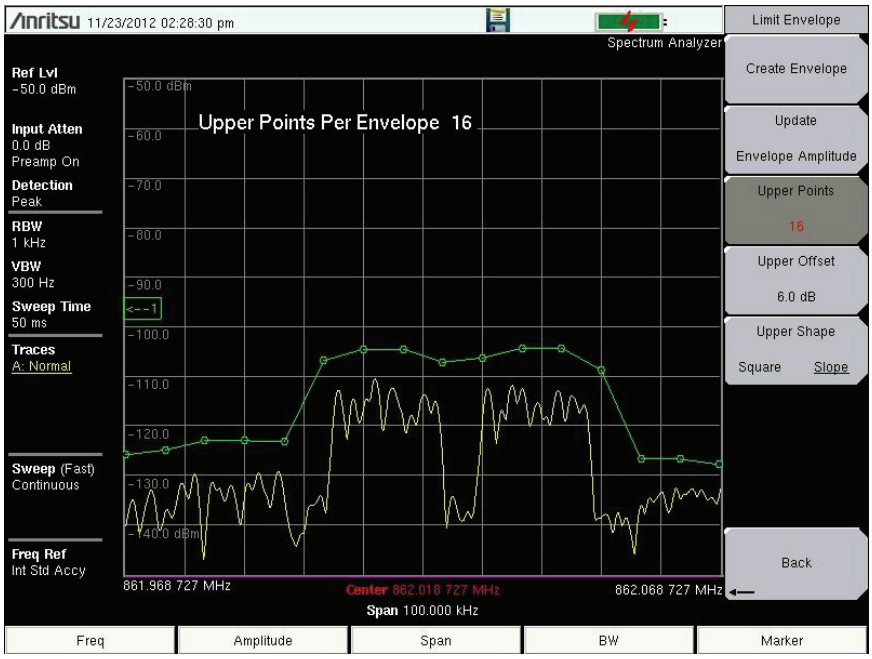
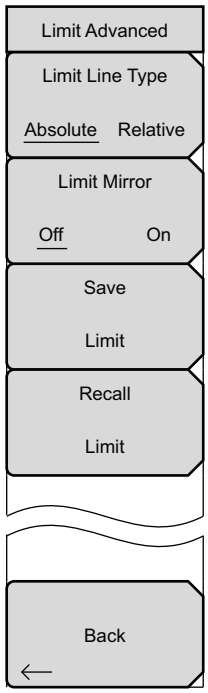


Figure 3-83. Sloped Limit Envelope

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 On/Off: 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.

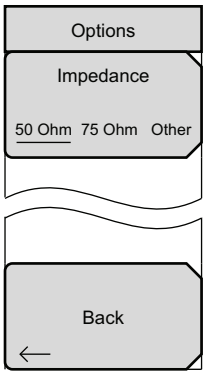
If you recall an absolute limit, and if it is off screen, then you will see the left or right limit off-screen indicator on the edge of the screen.

Back: Press this submenu key to return to the “Limit Menu” on page 3-81.

Figure 3-84. IA Limit Advanced Menu

3-19 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 3-85. IA Application Options

3-20 Other Menus

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

Chapter 4 — Channel Scanner (Option 27)

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

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

Refer to the 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.

Note	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.

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 or 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)
  - LTE Band 13 DL channel 5230 (751 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 or 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 Menu Map

Figure 4-1 shows a map of the Channel Scanner menus. The following sections describe Channel Scanner 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. Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to menu descriptions).

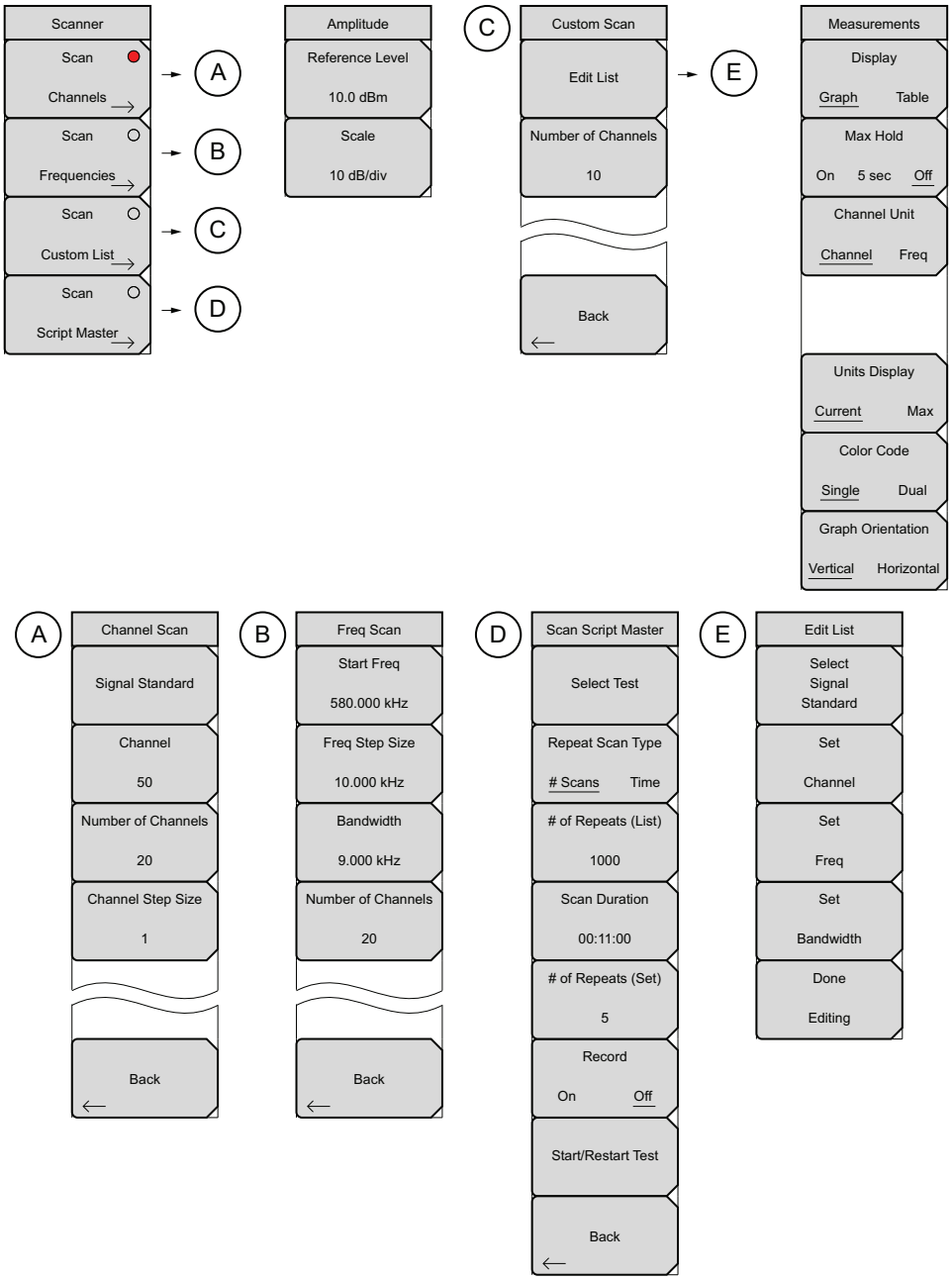
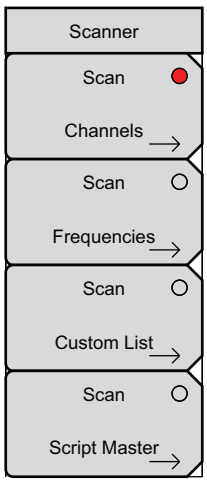


Figure 4-1. Channel Scanner Main Menu Keys

4-8 Scanner Menu

Key Sequence: **Scanner**



Scan Channels: Opens the "Channel Scan Menu" on page 4-7.

Scan Frequencies: Opens the "Freq Scan Menu" on page 4-8.

Scan Custom List Frequencies: Opens the "Custom Scan Menu" on page 4-11.

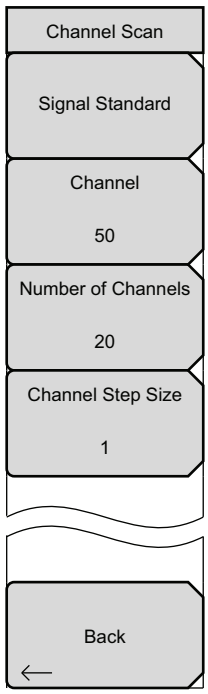
Scan Script Master: If no script list is currently in use, the Select Script Master Scan Setup File dialog opens to select a script file for measurement use. Select a file and press **Enter**. The Scan Script Master menu is listed.

If a script file has been selected or in use, then the "Scan Script Master Menu" on page 4-9 is listed. The submenu keys allow you to import a new file or change any parameter set in the Script Master file created in Master Software Tools.

Figure 4-2. Channel Scanner Scanner Menu

Channel Scan Menu

Key Sequence: **Scanner** > Scan Channels > Scan Channels



Signal Standard: Opens the Signal Standards list dialog to select a signal standard.

Channel: Opens the Channel Editor list to set a valid band in the selected signal standard.

Number of Channels: Sets the number of channels to be displayed. From 1 to 20 channels can be displayed.

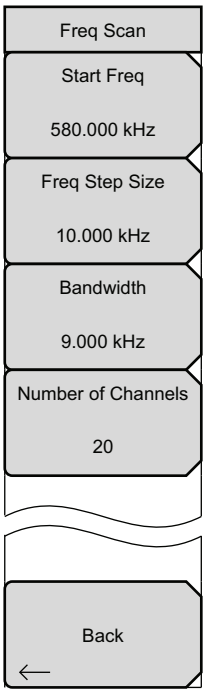
Channel Step Size: Sets the number of channels to skip between displayed channels.

Back: Returns to the "Scanner Menu" on page 4-7.

Figure 4-3. Channel Scanner Channel Scan Menu

Freq Scan Menu

Key Sequence: **Scanner** > Scan Frequencies > Scan Frequencies



Start Freq: Sets the center frequency of the first channel to be displayed.

Freq Step Size: Sets the spacing between frequencies on the display.

Bandwidth: The channel bandwidth can be manually entered in GHz, MHz, kHz, or Hz.

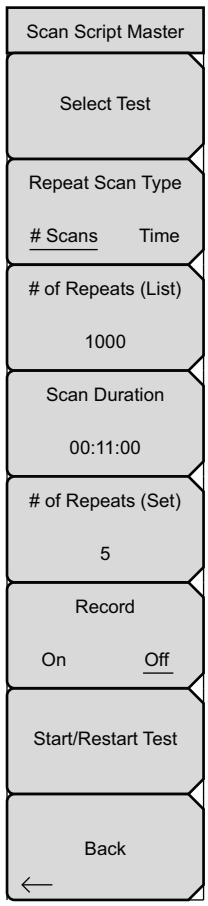
Number of Channels: Sets the number of channels to be displayed (1 to 20).

Back: Returns to the "Scanner Menu" on page 4-7.

Figure 4-4. Channel Scanner Frequency Scan Menu

Scan Script Master Menu

Key Sequence: **Scanner** > Scan Script Master > Select Setup File > Scan Script Master



Select Test: Opens the Select Script Master Scan Setup File dialog to select a script file for measurement use.

Repeat Scan Type #Scans/Time: 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.

# of Repeats (List): Sets the number of scan repetitions for the # of Repeats (Set).

Scan Duration: Sets the period of time channel scanning takes place for use with Repeat Scan Type.

# of Repeats (Set): Sets the number of times each set of 20 channels are scanned.

Record On/Off: Turns on the record mode. When the set # Scans are completed or the set Time has ended, the measurements will be stored to memory.

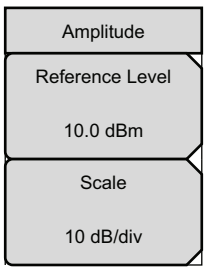
Start/Restart Test: Starts running a selected measurement or restarts a measurement that is running.

Back: Returns to the "Scanner Menu" on page 4-7.

Figure 4-5. Channel Scanner Scan Script Master Menu

4-9 Amplitude Menu

Key Sequence: **Amplitude**



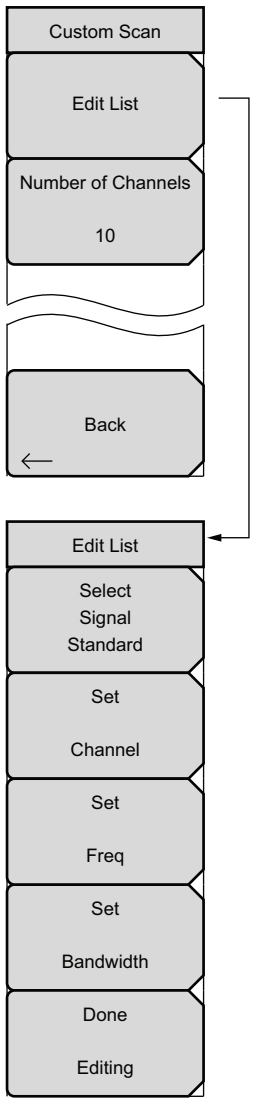
Reference Level: Activates the amplitude reference level function which sets the amplitude at the top of the display. Valid reference levels are from +30 dB to –150 dBm.

Scale : Activates the scale function which sets the dB/division value from 1 dB/div to 15 dB/div in 1 dB steps.

Figure 4-6. Channel Scanner 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.

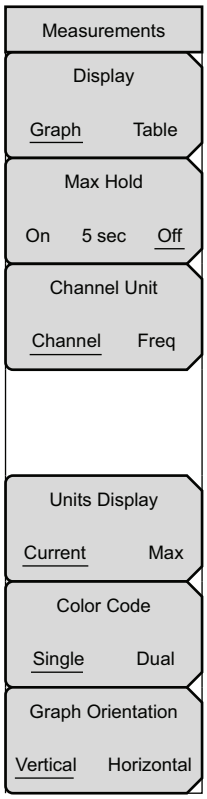
Number of Channels: Sets the number of channels to be displayed (1 to 20).

Back: Returns to the previous menu.

Figure 4-7. Channel Scanner Custom Scan Menu

4-11 Measurements Menu

Key Sequence: **Measurements**



Display Graph/Table: Toggles the display between table and graph formats, see Figure 4-9 and Figure 4-10 for examples of the two formats.

Max Hold On/5 sec/Off: 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.

Channel Units Channel/Freq: Toggles the display channel units between channel number and frequency.

Units Display Current/Max: 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).

Color Code Single/Dual: Channels can be represented in one color or two alternating colors.

Graph Orientation Vertical/Horizontal: When Graph is selected in the Display submenu, this key toggles the graph orientation between vertical and horizontal.

Figure 4-8. Channel Scanner 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

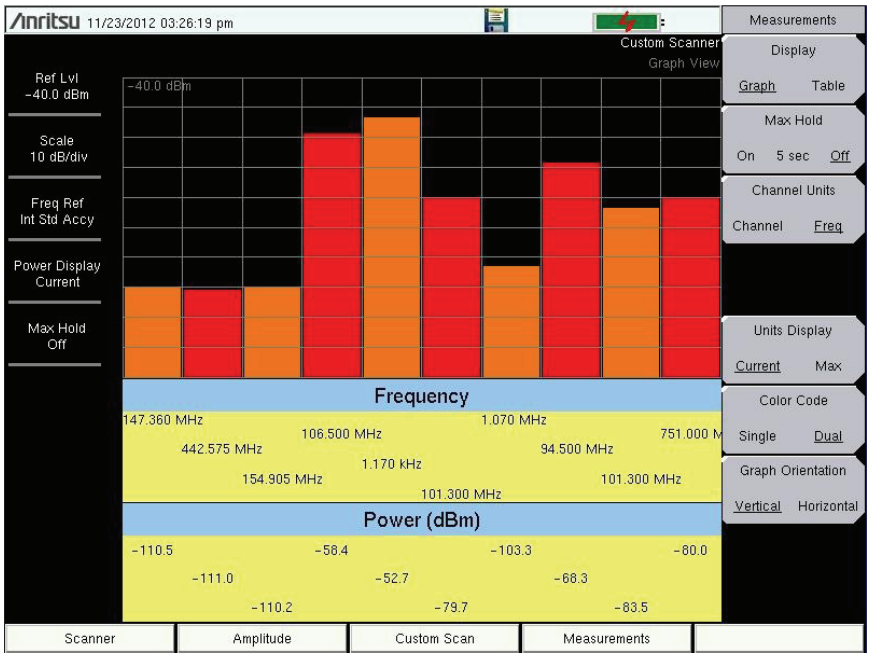


Figure 4-9. Channel Scanner Graph Display with Vertical Orientation

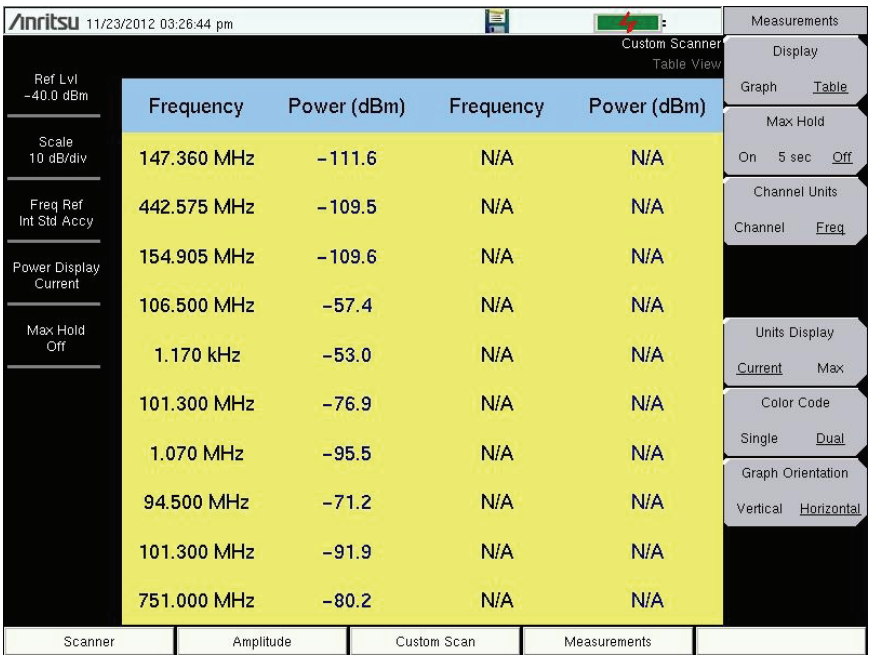


Figure 4-10. Channel Scanner Table Display

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)

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

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. The “fixed” CW signal levels vary as a function of the frequency.

Required Equipment

- CW Signal Generator Kit

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 Spectrum Analyzer RF In port as show in Figure 5-1.

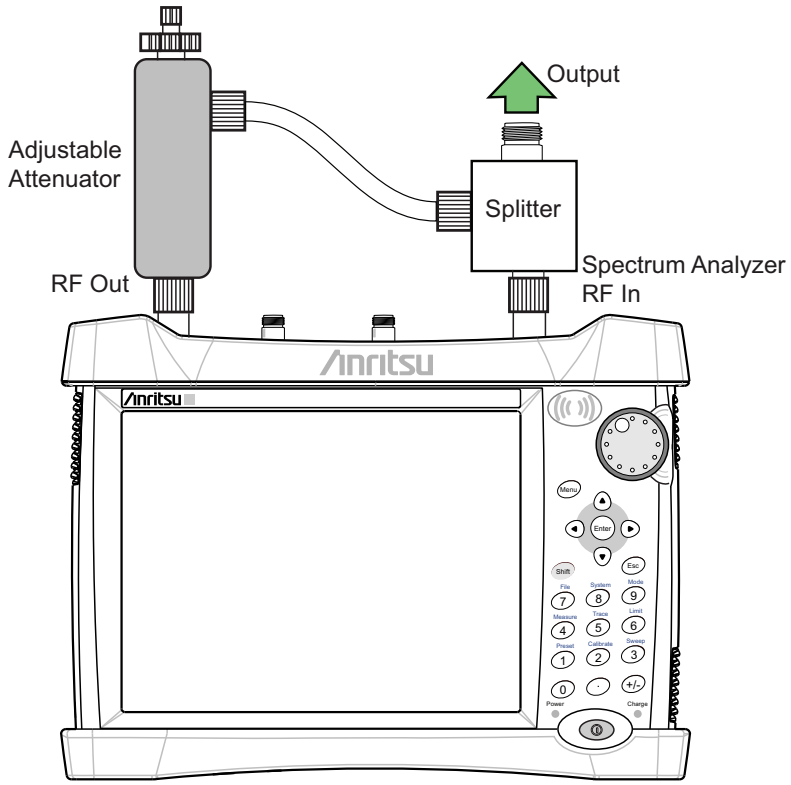


Figure 5-1. CW Signal Generator Configuration

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

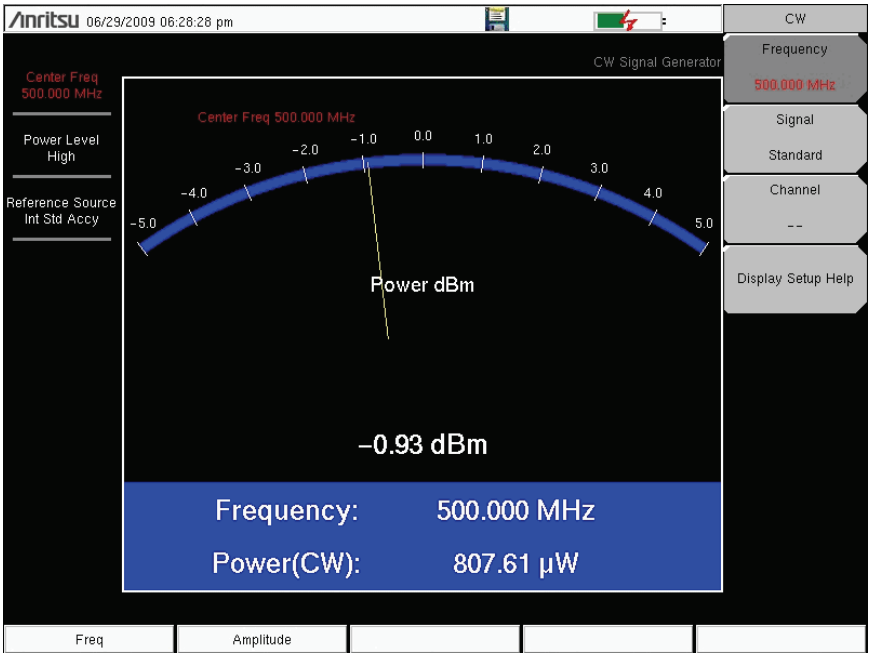


Figure 5-2. CW Signal Generator Frequency Menu

4. 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.

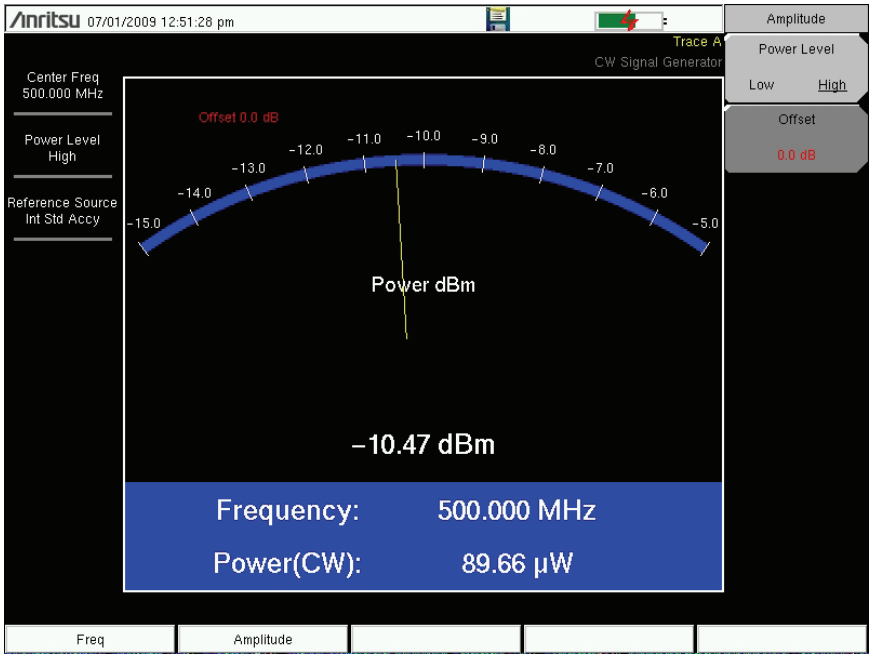


Figure 5-3. CW Signal Generator Frequency Menu

5. 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.
6. 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

6-1 Introduction

Coverage Mapping option allows users to map RSSI and ACPR measurements. The Anritsu easyMap Tools program creates special maps compatible with Anritsu handheld spectrum analyzers. The software creates files with or without GPS information. The files will have a .map extension. easyMap Tools is available from the Anritsu website (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 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, "Spectrum Analyzer" 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 Coverage Mapping. Press **Shift** + **Measure** (**4**) key followed by the Coverage Mapping submenu key.

6-4 Coverage Mapping

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

Coverage Mapping 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 combine the data with a map.

Outdoor Coverage

With a valid GPS signal, the instrument will identify the current location on the displayed GeoEmbedded map with a plus sign. Previously saved locations are displayed as squares. Using GPS; latitude, longitude and altitude information is automatically saved for each saved location.

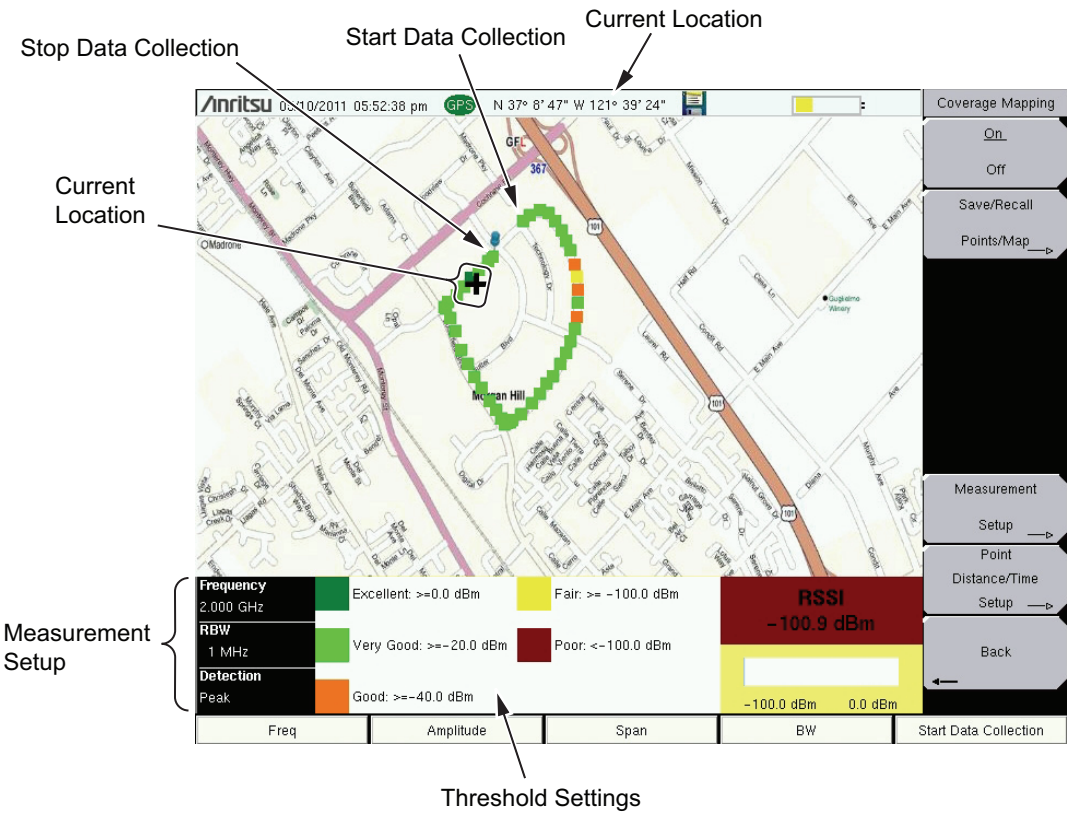


Figure 6-1. Outdoor Coverage Mapping (GPS On)

Note	The Measurement Setup and Threshold Setting boxes can be used as menu shortcuts on touch screen instruments. Use the touch screen to select the parameter to edit.

Indoor Coverage

With GPS turned off, and a non-GeoEmbedded map file the user indicates the current position (+) with the touch screen or arrow keys on instruments that do not have a touch screen. Previously saved locations are displayed as squares.

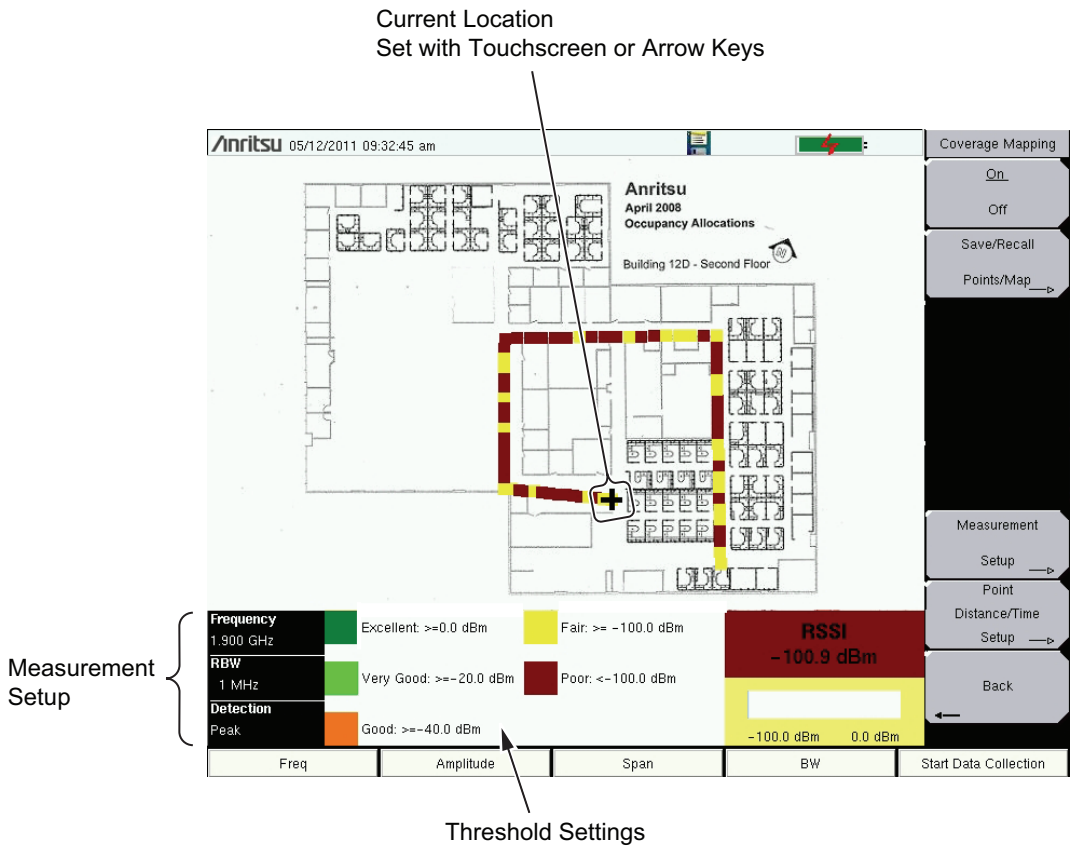


Figure 6-2. Indoor Coverage Mapping (GPS Off)

Coverage Mapping is a four step process:

- Create an indoor or outdoor map using "Anritsu easyMap Tools".
- Load the map and configure the "Instrument Settings" on page 6-5.
- Install an antenna on the instrument and "Map the Signal Strength" on page 6-7.
- "Save the Coverage Mapping Information" on page 6-8.

Anritsu easyMap Tools

Anritsu easyMap Tools 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).

Anritsu easyMap Tools allows you to capture maps of any location and create Anritsu Map Files. These maps are viewed on the Anritsu instrument during coverage mapping. There are two Anritsu Map Files formats:

- legacy .map map files
- .azm map files (not currently compatible with Coverage Mapping)

Download easyMap Tools from the Anritsu website (www.anritsu.com). Additional information about easyMap Tools is available in the software Help.

Note	The coverage map should extended beyond estimated location of bearing readings and have the general location of the interferer centered in the map.

Outdoor Maps

Type an address in easyMap Tool and capturing the map with GPS data.

Indoor Map

In easyMap Tools open bitmapped image (JPEG, GIF, TIFF, or PNG) of the floor plan for indoor mapping. The image size should be close to 666 pixels x 420 pixels (~1.6:1 ratio).

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

Instrument Settings

Setup

1. Create the appropriate map with easyMap Tools. Refer to "Anritsu easyMap Tools" on page 6-4 and the software Help. 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 Coverage Mapping submenu key. Confirm that coverage mapping is On. On or Off is underlined on the submenu key in the Coverage Mapping menu.

   Continue with 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.

Note	Set the supply voltage to 5 V by pressing the GPS Voltage submenu key and selecting 5.

   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 turns 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 easyMap Tools). 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, you position the plus sign at the current location by using the touch screen, or by using the arrow keys, and then pressing **Enter**.

Connect the USB flash drive that has the map file or files created in "Anritsu easyMap Tools" on page 6-4 to the instrument.

1. Press 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 Step 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 plus sign with outdoor mapping.

6. If the current location is outside the map boundaries, then an arrow indicates 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, then: 1. Press the Refresh Directories key. 2. If the drive is still not visible, then 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 easyMap Tools 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 6-14 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. Press the Coverage Mapping submenu key.
2. Press the Save/Recall Points/Map submenu key.
3. Press the Recall Default Grid submenu key.

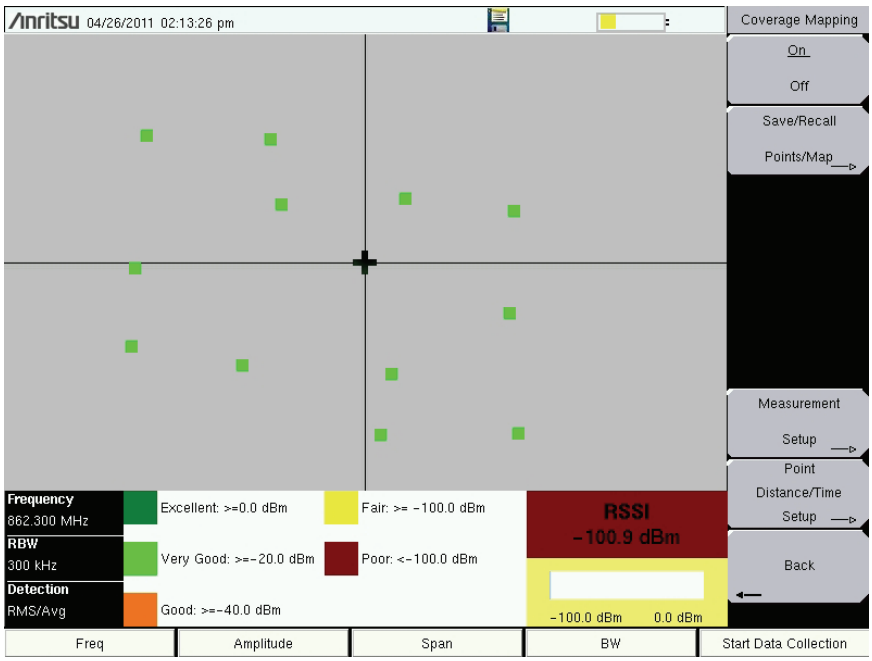


Figure 6-3. Coverage Mapping with the Default Grid.

Map the Signal Strength

Coverage Mapping supports RSSI measurement or ACPR measurement during mapping.

Note	The default settings for coverage mapping sets the internal input attenuator to 0 dB (off) with the preamp on and a bandwidth of 1 MHz. These parameters can be adjusted depending on the power of signal power to be measured. Overdriving the input of the spectrum analyzer can result in ADC Overdrive errors. Adjust the parameter using the **Amplitude** main menu and **BW** main menu. Once data collection begins, parameters such as amplitude, bandwidth or measurement setup cannot be changed.

ACPR

1. Select the Coverage Mapping submenu key.
2. Press the Measurement Setup submenu key.
3. Set the Center Freq, RBW, and Detection type. Refer to Chapter 2, "Spectrum Analyzer" for additional information.
4. 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)
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 6-16. The color of the squares indicate the power level based on the 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 6-14.

Note	The collected data can be saved in multiple formats.

RSSI

1. Press the Coverage Mapping submenu key.
2. Press the Measurement Setup submenu key.
3. Set the Center Freq, RBW, and Detection type. Refer to Chapter 2, "Spectrum Analyzer" for additional information.
4. Press RSSI once to select and again to open the setup menu.
5. Set the threshold levels: Excellent, Very Good, Good, Fair, and Poor.
6. 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 6-16. The color of the squares indicate the power level based on the RSSI setup.

7. 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 6-14.

Note	Frequency, RBW, Detection Type, and Threshold levels can also be changed using the touch screen on supported instruments.

Interior coverage mapping has two options considering that the instrument does not have location or distance information available without GPS.

Option 1: Set the Repeat Type to Time and walk the perimeter of the coverage area. Press the touch screen (or use the arrow keys to set the location and press **Enter**) 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 touch screen (or use the arrow keys to set the location and press **Enter**) at any time that signal power data points are 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

Coverage Mapping has three save options: "Save KML Points", "Save Tab Delimited Points" on page 6-10, or "Save JPG" on page 6-10.

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 that are 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 6-4 on page 6-9) and can also be recalled and viewed on the instrument. Refer to "Mapping Save/Recall Menu" on page 6-14 for additional information.

Note

Installing Google Earth

1. Go to the website: 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 in 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 cannot be viewed directly from the instrument using Google Earth. The files need to be first copied to a USB memory stick.

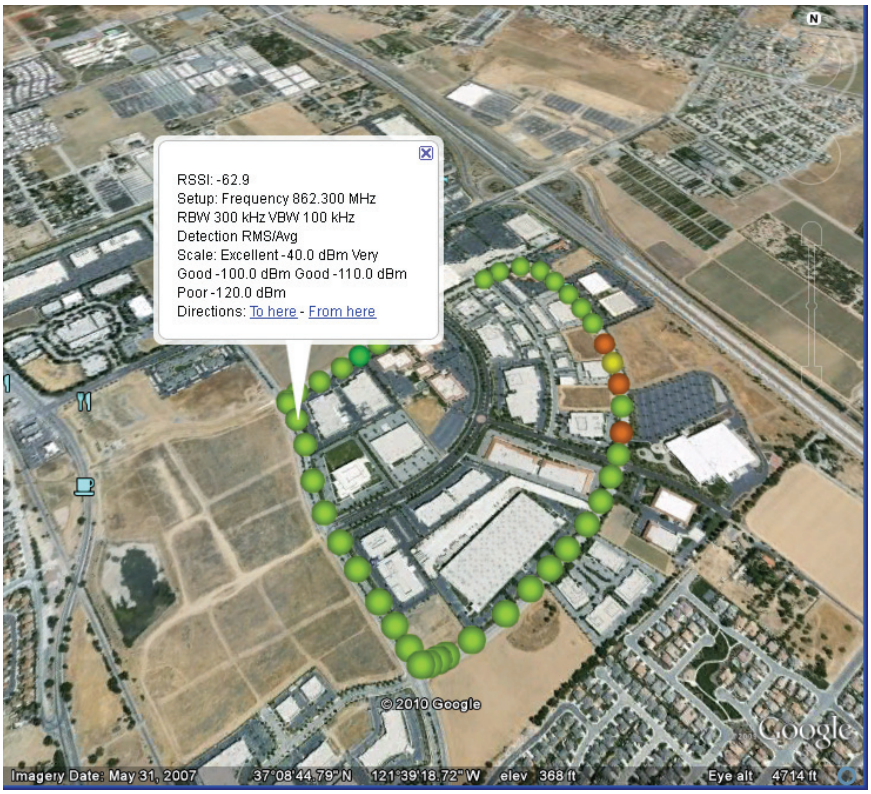


Figure 6-4. Coverage Mapping KML File in Google Earth

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 Save then 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.

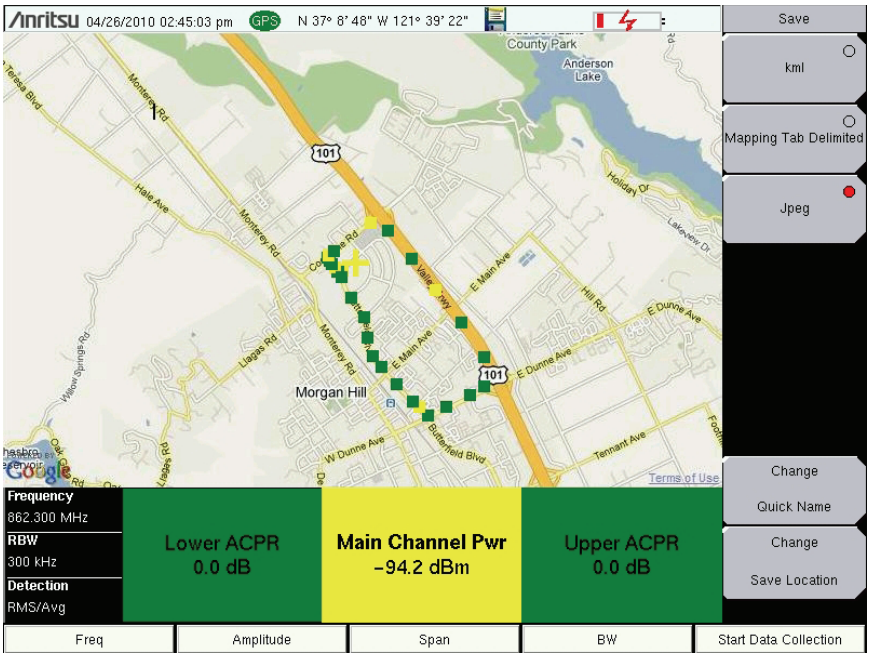


Figure 6-5. Time Interval Coverage Mapping Saved as a .jpg File

6-5 Coverage Mapping Menus

Figure 6-6 shows the map of Coverage Mapping menus. Refer to Chapter 2, "Spectrum Analyzer" for additional information on Spectrum Analysis menus. Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to menu descriptions). Section 6-6 describes the details of Coverage Mapping menus and submenus.

Coverage Mapping menus and submenus (1 of 2)

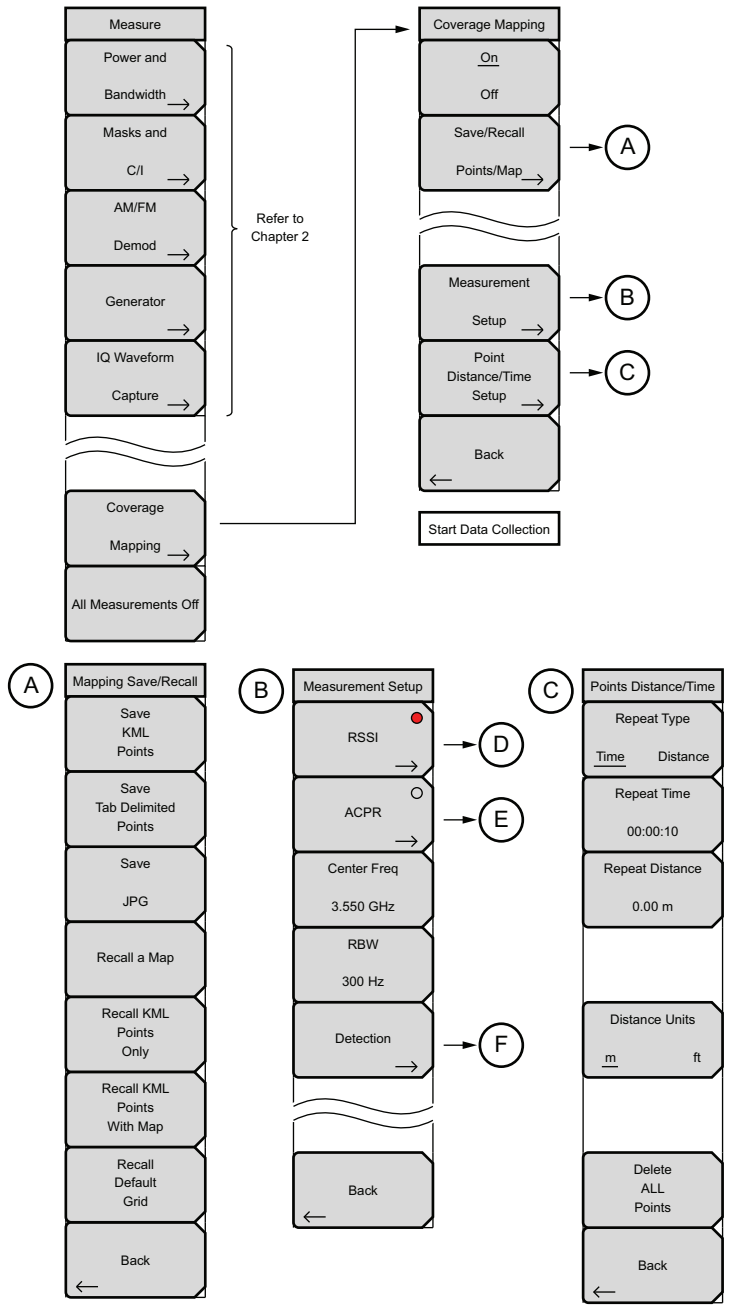


Figure 6-6. Coverage Mapping Menu Keys

Coverage Mapping menus and submenus (2 of 2).

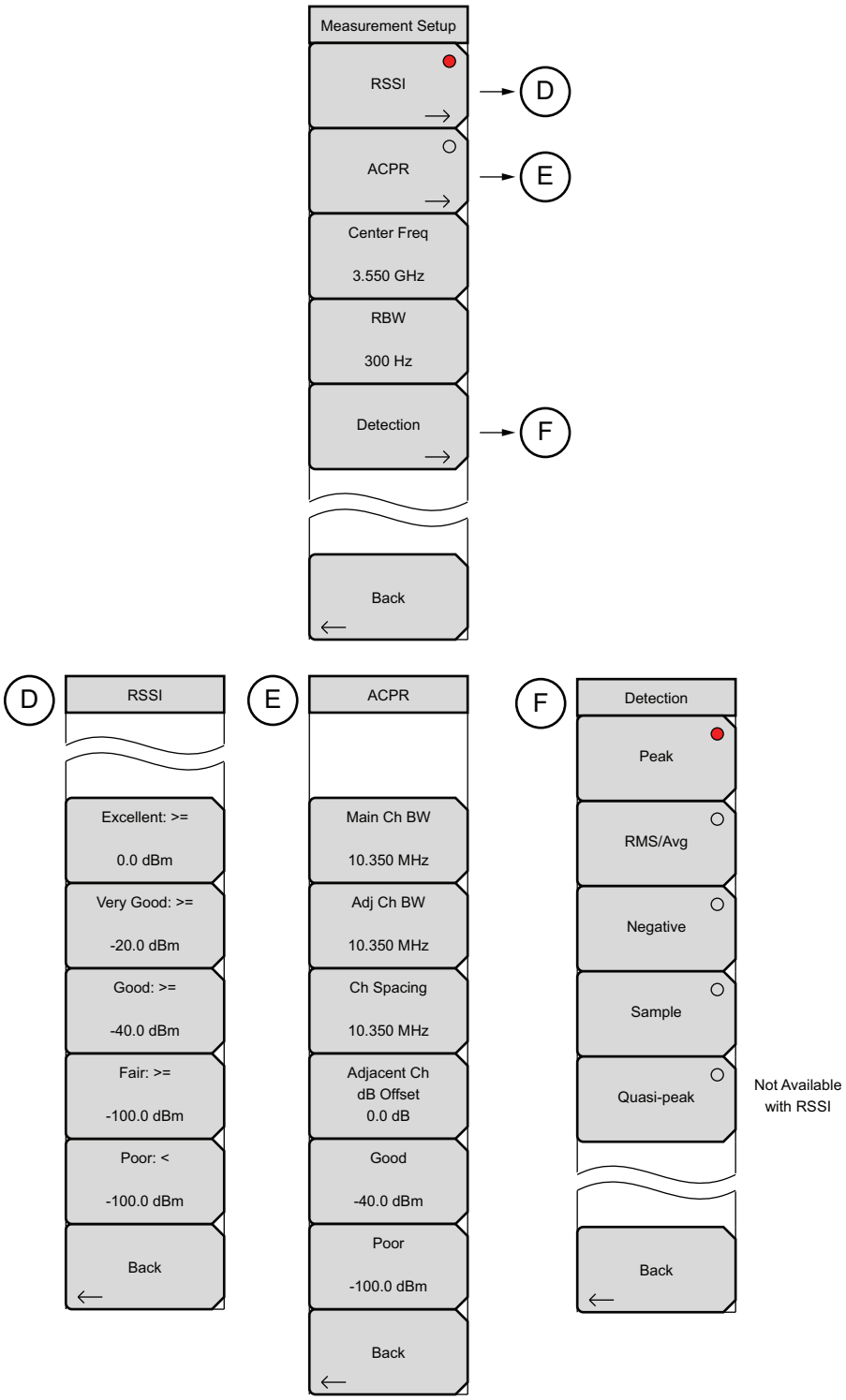
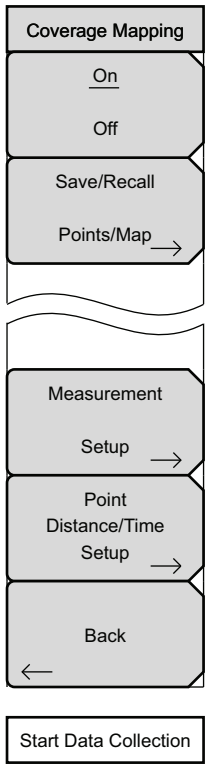


Figure 6-7. Coverage Mapping Menu Keys (Part 2)

6-6 Coverage Mapping Menu

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



On Off: 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.

Save/Recall Map Points: Opens the "Mapping Save/Recall Menu" on page 6-14.

Measurement Setups: Opens the "Measurement Setup Menu" on page 6-15.

Point Distance/Time Setup: Opens the "Point Distance/Time Setup Menu" on page 6-16.

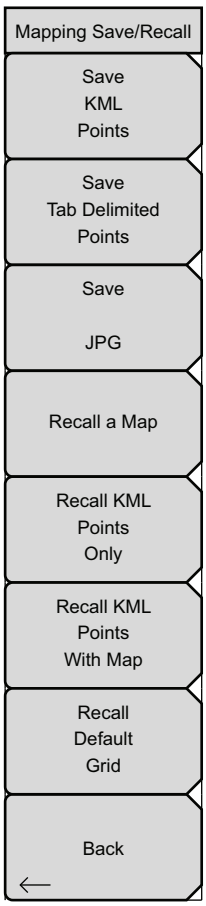
Back: Returns to the "Measure Menu" on page 2-57.

Start/Stop Data Collection: Press this main menu key to **Start** collection of coverage mapping data based on the settings of Measurement Setup and Point Distance/Time Setup. A running count of collected data points is displayed at the bottom of the sweep window. Press this main menu key again to **Stop** data collection.

Figure 6-8. Coverage Mapping Menu

Mapping Save/Recall Menu

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



Save KML Points: 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: Press this button to save the points in a tab delimited text file. FileName.mtd will be stored in the selected location.

Save JPG: Press the Save JPG key to save a .jpg file of the current screen.

Recall a Map: Opens the Recall menu for selecting a map created with the Anritsu easyMap Tools program to display on the screen.

Recall KML Point: Opens the Recall menu for selecting a .kml file. Displays the saved locations overlaid on the default grid.

Recall KML Points With Map: 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.

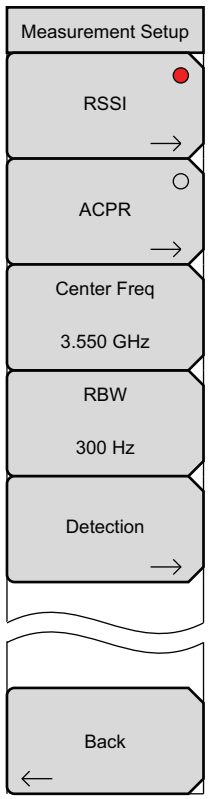
Recall Default Grid: If you do not have a GPS embedded map but are out in the field making measurements and would like to save the KML points, the Recall Default Grid submenu allows you to save points and the corresponding GPS coordinates to view at a later time.

Back: Returns to the “Coverage Mapping Menu” on page 6-13.

Figure 6-9. Mapping Save/Recall Menu

Measurement Setup Menu

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



RSSI: 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. Refer to "RSSI Menu" on page 6-17.

ACPR: 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. Refer to "ACPR Menu" on page 6-18.

Center Freq: Press the Center Freq submenu key and enter the desired frequency using the keypad, the left or right 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 effect as the MHz submenu key.

RBW: 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 begins at 1 Hz and increases in a 1 to 3 sequence from 1 Hz to 3 Hz to 10 Hz, from 10 Hz to 30 Hz to 100 Hz, and so on. To determine the range for your instrument, refer to your Technical Data Sheet.

Detection: 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.

Options Include:

- Peak
- RMS/Avg
- Negative
- Sample
- Quasi-peak

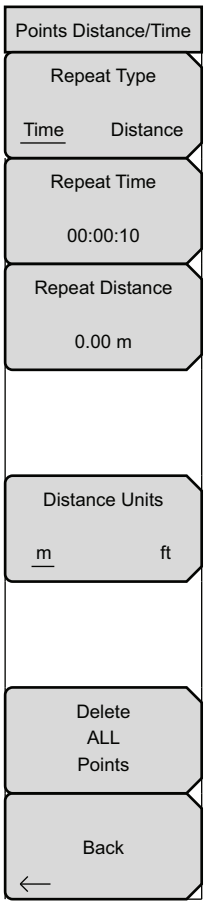
Refer to "Detection Menu" on page 2-45 for additional details.

Back: Returns to the "Coverage Mapping Menu" on page 6-13.

Figure 6-10. Measurement Setup Menu

Point Distance/Time Setup Menu

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



Repeat Type: Toggles between using a Time or Distance interval for capturing data.

Repeat Time: Sets the time interval when the Time is selected in the Repeat Type button.

Repeat Distance: Sets the distance interval when the Distance is selected in the Repeat Type button.

Distance Units: Toggles the unit of measure between meters and feet.

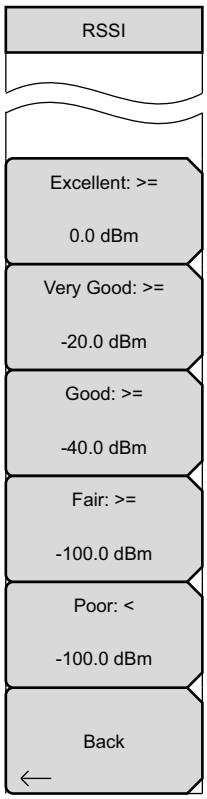
Delete ALL Points: Deletes any and all map points.

Back: Returns to the "Coverage Mapping Menu" on page 6-13.

Figure 6-11. Point Distance/Time Setup Menu

RSSI Menu

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



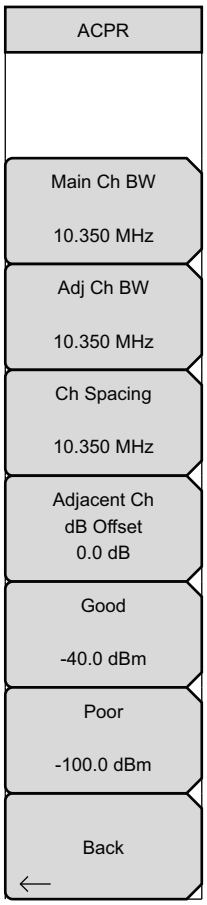
The settings in this menu are used to set the color values for the recorded power during data collection. The legend displays the entered values.

Back: Returns to the "Coverage Mapping Menu" on page 6-13.

Figure 6-12. Coverage Mapping RSSI Menu

ACPR Menu

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



Main Ch BW: 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.

Adj Ch BW: 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.

Ch Spacing: 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 up or down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu" on page 2-39. The left or right arrow keys change the value by 10% of the span.

Adjacent Ch dB Offset: Sets the power ratio offset of the adjacent channels for ACPR measurement.

Good and Poor: The settings in this menu are used to set the color values for the recorded power during data collection. The colors of the boxes at the bottom of the screen change based on the measured values.

Back: Returns to the "Coverage Mapping Menu" on page 6-13.

Figure 6-13. Coverage Mapping ACPR Menu

Refer to Chapter 2, "Spectrum Analyzer" for additional spectrum analyzer menus.

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

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

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 the following 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 the 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, 20 kHz, 70 kHz, or 140 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.
5. **AM/FM/PM Coverage Mapping (Option 431 and Option 31 also required)** allows users to map SINAD and Carrier Power measurements in a given geographical area.

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 (IF Bandwidth) 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.

Next use either Step 4 or Step 5.

4. Press the **Freq** main menu key and press the Center Freq submenu key to set the desired center frequency. In RF Spectrum measurements, press the Set Carrier Freq to Center submenu key to adjust the signal position to the center of the display screen. Or, you may also choose a Signal Standard, which sets the frequency.

Note	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.

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.
6. If you used Step 5, 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.

Note	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 (IF Bandwidth) 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.
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.

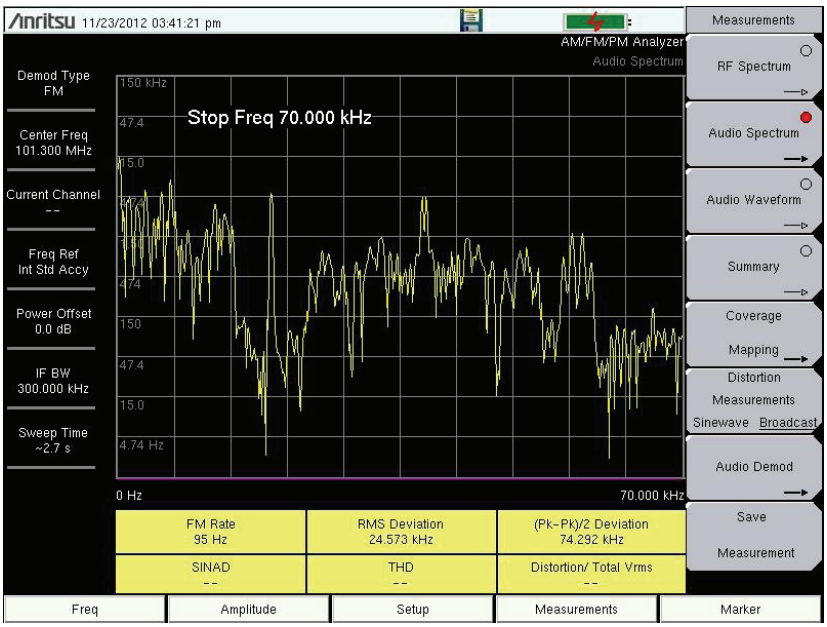


Figure 7-1. Audio Spectrum

In this view, you can see the 19 kHz stereo pilot tone as well as other subcarriers.

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.

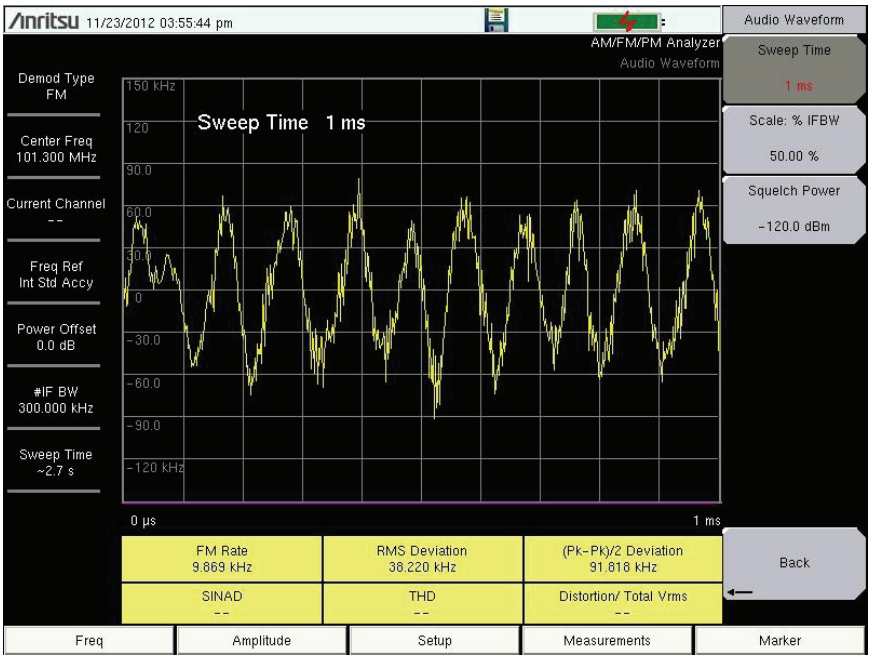


Figure 7-2. Audio Waveform

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.

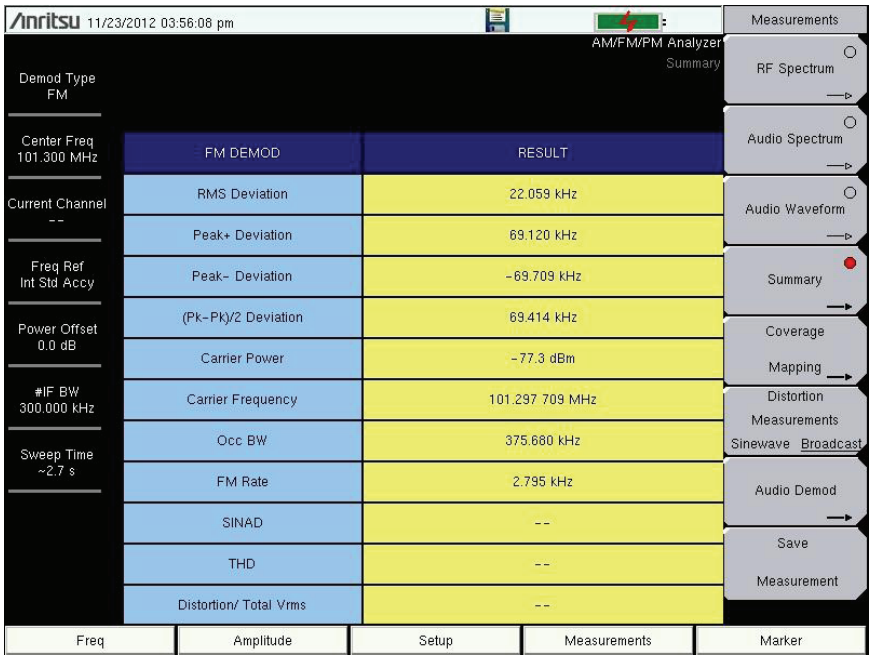


Figure 7-3. Audio Summary

Note	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.

12. For instruments that have Option 431, press the Coverage Mapping submenu key to setup mapping of Signal-to-Noise and Distortion (SINAD) ratio and/or Carrier Power. Refer to Figure 7-4 for an example of coverage mapping. After coverage mapping is turned on, press Measurement Setup to select SINAD and/or Carrier Power and set the threshold levels.

Note	Frequency, Demod Type, IF Bandwidth and Threshold levels can also be changed using the touch screen.

The menu structure for coverage mapping is shown starting in "AM/FM/PM Analyzer Menus" on page 7-8.

Refer to Chapter 6, "Coverage Mapping" for an overview of the coverage mapping four step process:

- Create a GPS enabled map for outdoor mapping using "Anritsu easyMap Tools" on page 6-4.
- Load the map and configure the "Instrument Settings" on page 6-5.
- Install an antenna on the instrument and "Map the Signal Strength" on page 6-7.
- "Save the Coverage Mapping Information" on page 6-8.

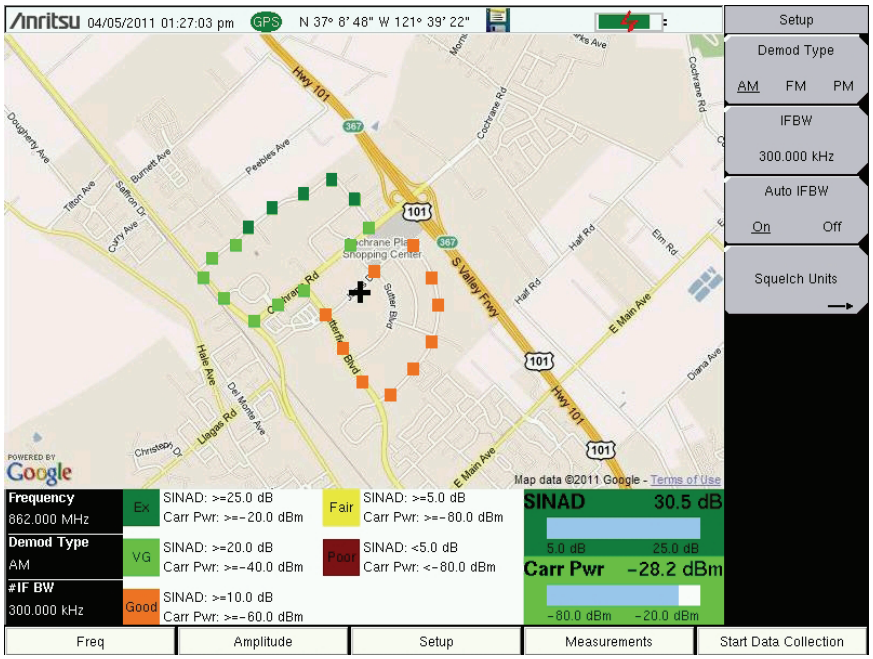


Figure 7-4. Mapping of AM Signal SINAD and Carrier Power.

Note	AM/FM/PM Coverage mapping uses AM/FM/PM Analyzer mode not Spectrum Analyzer mode.

7-4 AM/FM/PM Analyzer Menus

The AM/FM/PM Analyzer controls are accessed via the main menu keys shown in Figure 7-5.

Map of Main Menus

Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to menu descriptions).

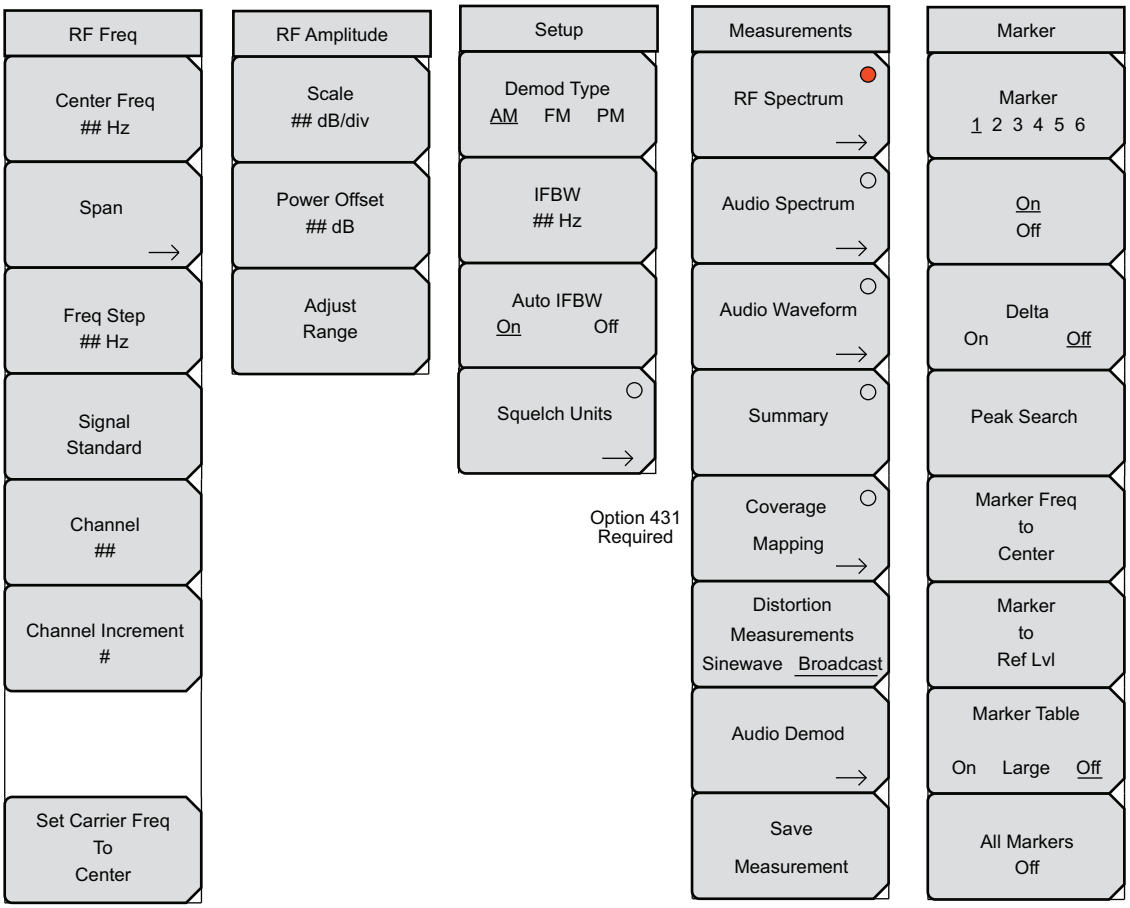


Figure 7-5. Main Menus with AM/FM/PM Analyzer (Option 509)

Map of Frequency Menus

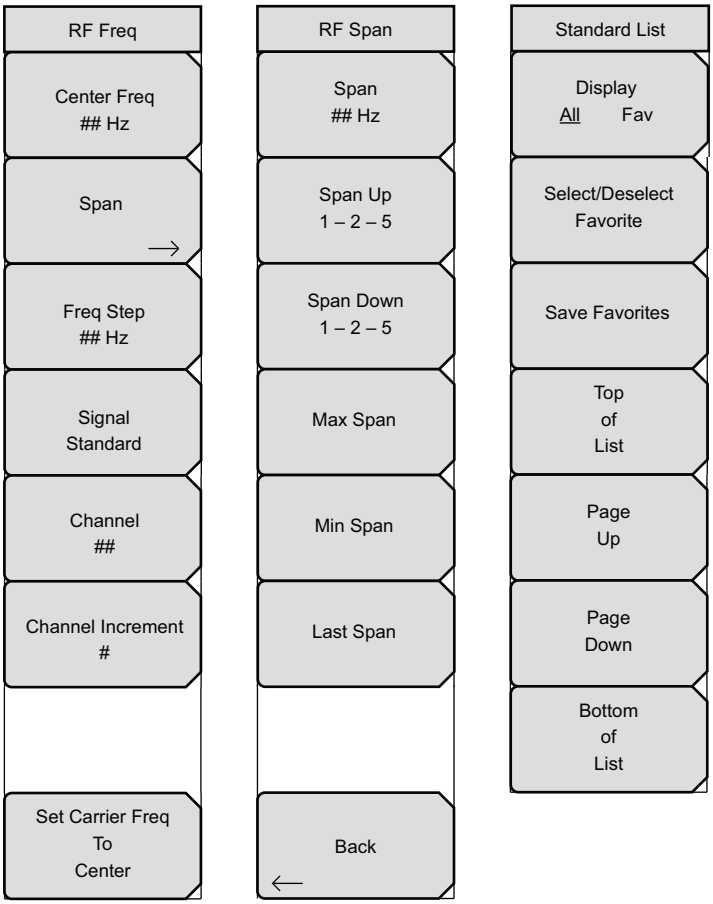


Figure 7-6. Frequency Menus with AM/FM/PM Analyzer (Option 509)

Map of Measurements Menus

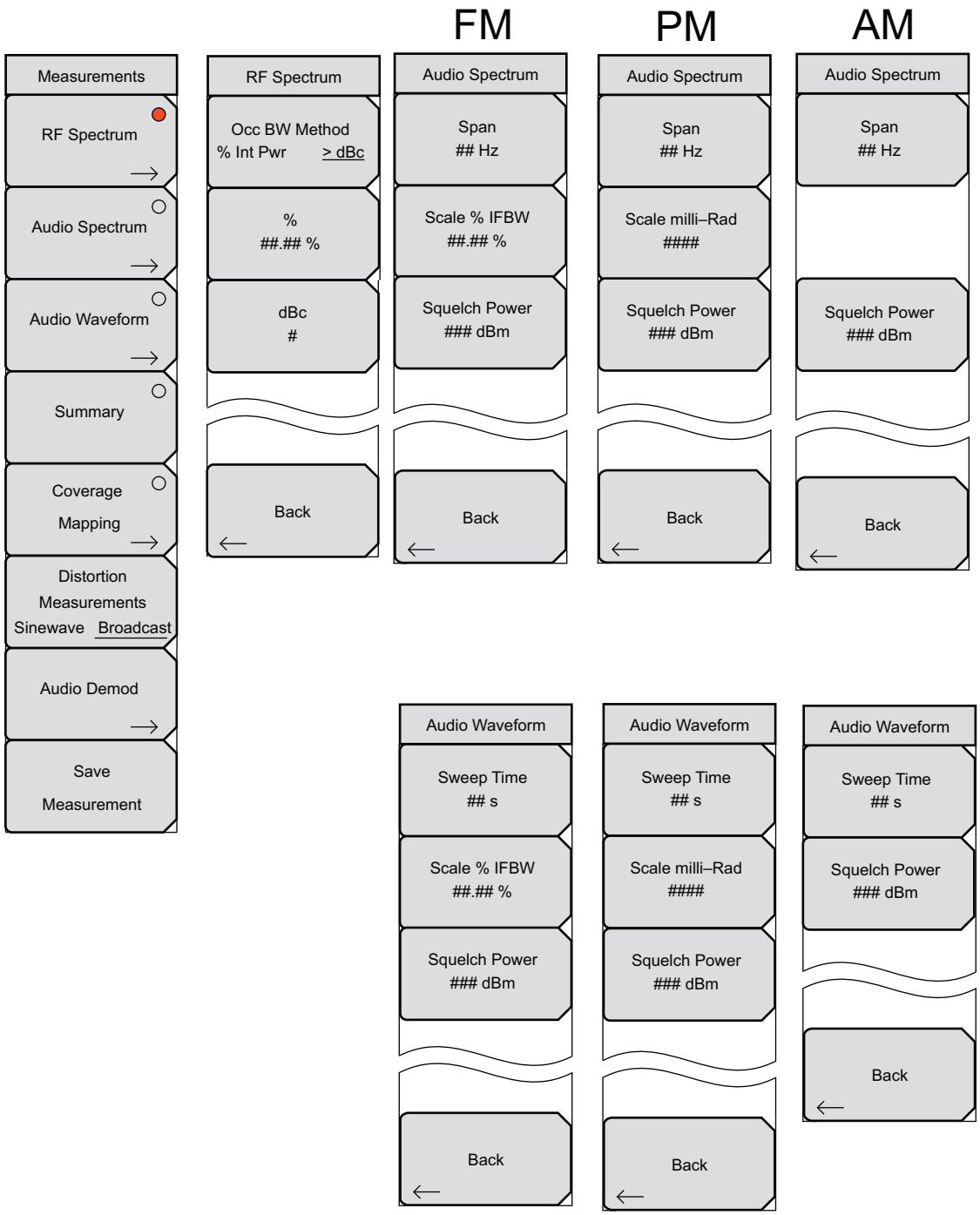


Figure 7-7. Measurements Menus with AM/FM/PM Analyzer (Option 509)

Map of Audio Demod Menus

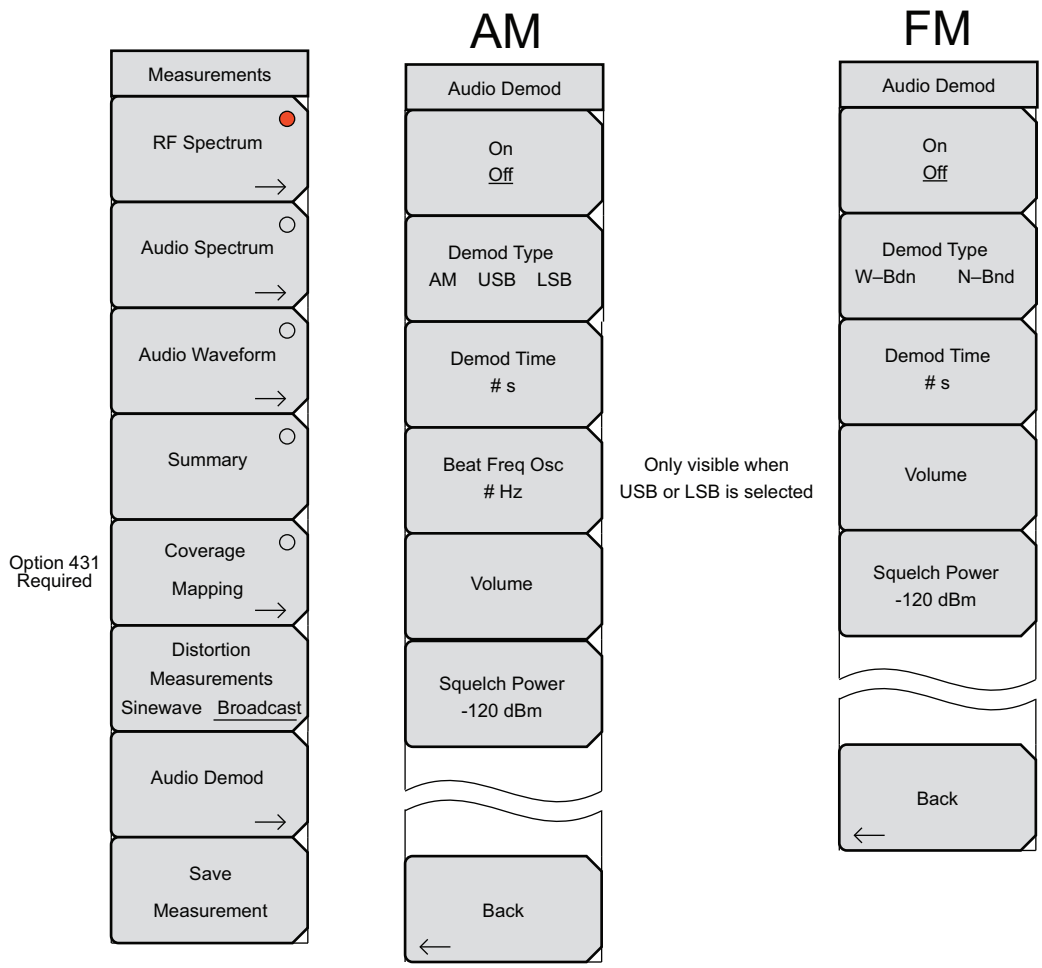
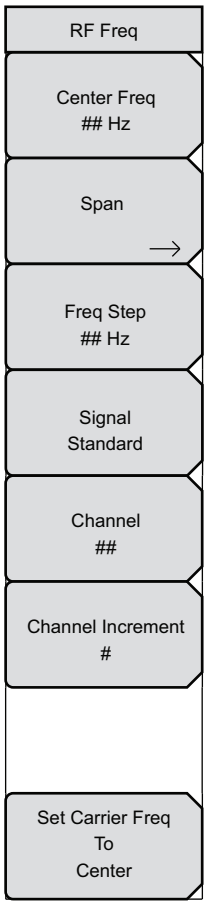


Figure 7-8. Audio Demod Menus with AM/FM/PM Analyzer (Option 509)

7-5 RF Freq (Frequency) Menu

Key Sequence: **Freq**



Center Freq: 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 **Enter** key has the same effect as pressing the MHz submenu key.

Span: Press to open the Span menu ("RF Span Menu" on page 7-13). 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: 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 or 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 up or down 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.

Signal Standard: 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 **Enter** key. Or press the **Esc** key to abort and exit without a change. Refer to the "(Signal) Standard List Menu" on page 7-14.

Channel: Press the up or 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.

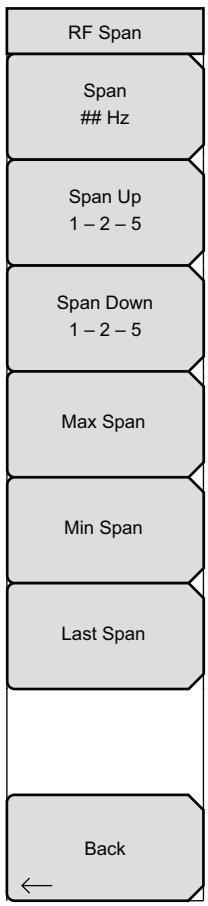
Channel Increment: Press to set the increment value for the Channel # submenu key

Set Carrier Freq To Center: 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.

Figure 7-9. RF Freq Menu

7-6 RF Span Menu

Key Sequence: **Freq** > Span



Span: 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 **Enter** key is the same as pressing the MHz submenu key. You may also use the rotary knob or the arrow keys, then press the **Enter** key.

Span Up: Press to increase the Span. If starting at 10 kHz, the span increases to 20 kHz, 50 kHz, 100 kHz, 200 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz and 10 MHz. Each press of this submenu key increases the span to one of these listed values.

Span Down: Press to decrease the Span. If starting at 5 MHz, then span decreases to 2 MHz, 1 MHz, 500 kHz, 200 kHz, 100 kHz, 50 kHz, 20 kHz, and 10 kHz. Each press of this submenu key decreases the span to one of these listed values.

Max Span: Press to set the span to 10 MHz, the maximum value.

Min Span: Press to set the span to 10 kHz, the minimum value.

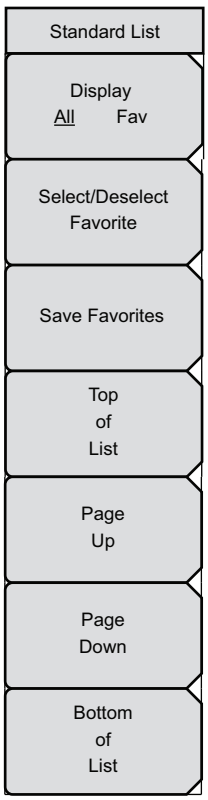
Last Span: Press to set the span to the previously set span value.

Back: Press to return to the RF Freq menu.

Figure 7-10. RF Span Menu

7-7 (Signal) Standard List Menu

Key Sequence: **Freq** > Signal Standard



Display

All Fav: 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: Press to mark (select) or unmark (deselect) signal standards in the Signal Standards list box.

Save Favorites: Press to save any selections (or de-escalations) in the list.

Top of List: Press to move the list display to show the first (top of list) standards.

Page Up: Press to move through the list one page at a time.

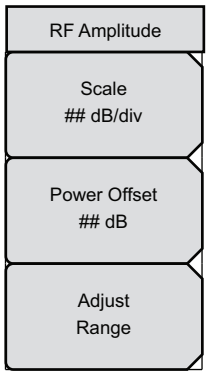
Page Down: Press to move through the list one page at a time.

Bottom of List: Press to move the list display to show the last (bottom of list) standards.

Figure 7-11. (Signal) Standard List Menu

7-8 Amplitude Menu

Key Sequence: **Amplitude**



Scale: Press to set the scaling factor in dB per division. Use the rotary knob, the arrow keys, or the numeric keypad, then press the **Enter** key.

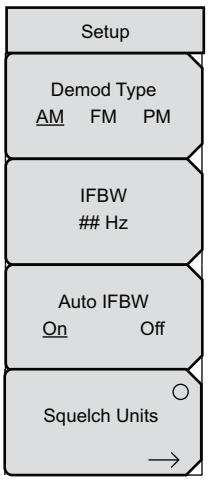
Power Offset: Press to set the power offset in dB. Use the rotary knob, the arrow keys, or the numeric keypad, then press the **Enter** key.

Adjust Range: Press to change the reference level if the signal strength is too high (ADC error) or too low.

Figure 7-12. Amplitude Menu

7-9 Setup Menu

Key Sequence: **Setup**



Demod Type

AM FM PM: 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.

IFBW: 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.

Auto IFBW

On Off: 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.

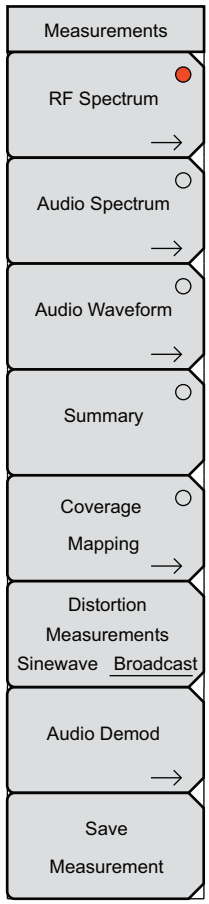
Squelch Units: Press to select whether the Squelch level is set in dBm or Volts.

Figure 7-13. 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.



RF Spectrum: 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: 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: 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: 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.

Coverage Mapping: Press to open the "Coverage Mapping Menu" on page 7-25. The circle on the submenu key face is red when the measurement is active.

Distortion Measurements: Displays SINAD, THD, and Distortion/Total Vrms values when Sinewave is selected. "- -" the values when Broadcast is selected.

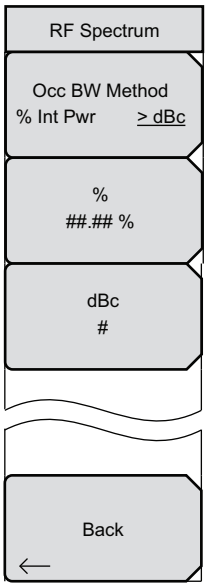
Audio Demod: Press to open the Auto Demod menu.

Save Measurement: Opens the Save menu.

Figure 7-14. Measurements Menu

7-11 RF Spectrum Menu

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



Occ BW Method

% Int Pwr >dBc: 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.

%: Press to set the percent for the Occupied BW calculation if the selected Occ BW Method is % Int Pwr.

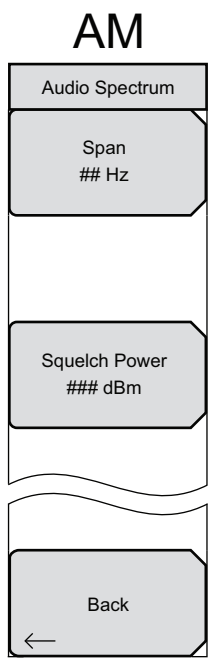
dBc: Press to set the dBc for the Occupied BW calculation if the selected Occ BW Method is >dBc.

Back: Press to return to the Measurements menu.

Figure 7-15. RF Spectrum Menu

7-12 Audio Spectrum AM Menu

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



Span: 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, 20 kHz, 70 kHz, and 140 kHz.

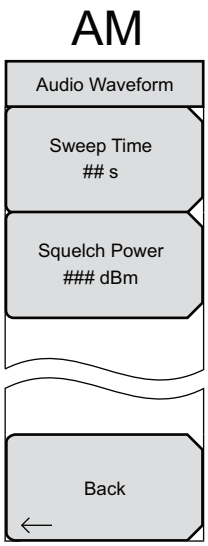
Squelch Power: Press to set the squelch power level.

Back: Press to return to the Measurements menu.

Figure 7-16. Audio Spectrum AM Menu

7-13 Audio Waveform AM Menu

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



Sweep Time: Press to set the sweep time. If you use the numeric keypad to enter a value, then the submenu keys change to Time in units of s, ms, µs, ns, or ps.

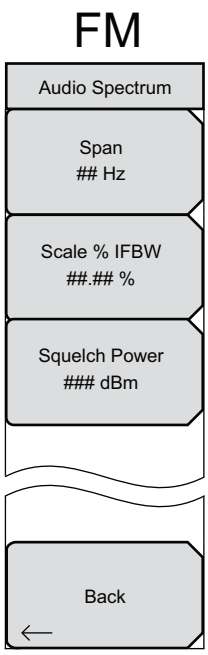
Squelch Power: Press to set the squelch power level.

Back: Press to return to the Measurements menu.

Figure 7-17. Audio Waveform AM Menu

7-14 Audio Spectrum FM Menu

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



Span: Press to set the FM 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, 20 kHz, 70 kHz, and 140 kHz.

Scale % IFBW: Press to set the sweep scale in percent of intermediate frequency bandwidth (IFBW). Use the numeric keypad, the rotary knob, or the arrow keys to set the percent value.

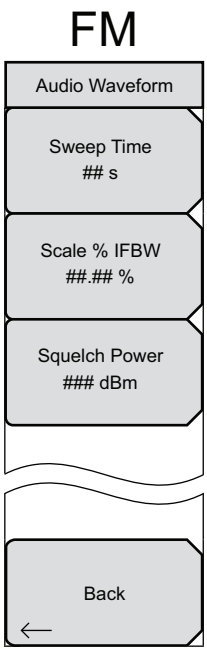
Squelch Power: Press to set the squelch power level.

Back: Press to return to the Measurements menu.

Figure 7-18. Audio Spectrum FM Menu

7-15 Audio Waveform FM Menu

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



Sweep Time: Press to set the sweep time. If you use the numeric keypad to enter a value, then the submenu keys change to Time in units of s, ms, µs, ns, or ps. The output turns On at the level that has been set with the Output Power submenu key. The current state (Off or On) is underlined.

Scale % IFBW: Press to set the sweep scale in percent of intermediate frequency bandwidth (IFBW). Use the numeric keypad, the rotary knob, or the arrow keys to set the percent value.

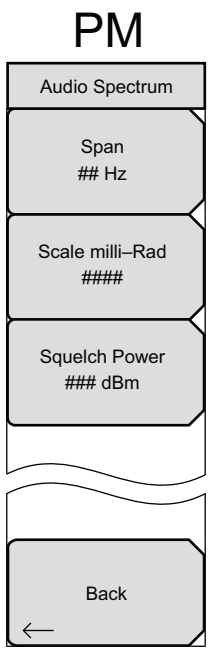
Squelch Power: Press to set the squelch power level.

Back: Press to return to the Measurements menu.

Figure 7-19. Audio Waveform FM Menu

7-16 Audio Spectrum PM Menu

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



Span: 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, 20 kHz, 70 kHz, and 140 kHz.

Scale milli-Rad: Press to set the scale in milliradians. Use the numeric keypad, the rotary knob, or the arrow keys to enter a value.

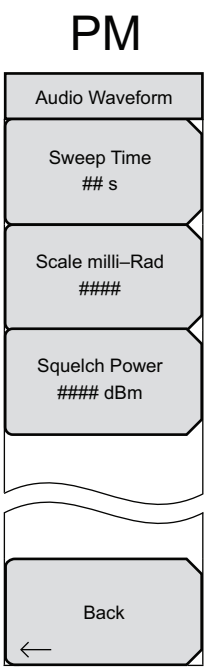
Squelch Power: Press to set the squelch power level.

Back: Press to return to the Measurements menu.

Figure 7-20. Audio Spectrum PM Menu

7-17 Audio Waveform PM Menu

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



Sweep Time: Press to set the sweep time. If you use the numeric keypad to enter a value, then the submenu keys change to Time in units of s, ms, µs, ns, or ps.

Scale milli-Rad: Press to set the sweep scale in milliradians. Use the numeric keypad, the rotary knob, or the arrow keys to enter a value.

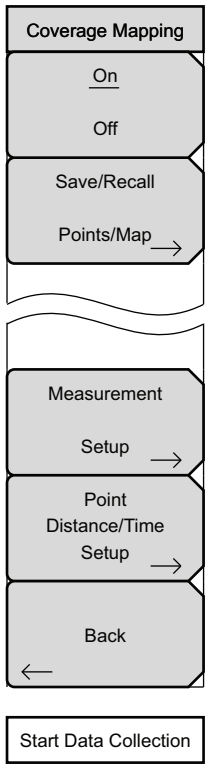
Squelch Power: Press to set the squelch power level.

Back: Press to return to the Measurements menu.

Figure 7-21. Audio Waveform PM Menu

7-18 Coverage Mapping Menu

Key Sequence: **Measure** or **(Shift + 4)** > Coverage Mapping



On Off: 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.

Save/Recall Map Points: Opens the "Mapping Save/Recall Menu" on page 7-26.

Measurement Setup: Opens the "Measurement Setup Menu" on page 7-27.

Point Distance/Time Setup: Opens the "Point Distance/Time Setup Menu" on page 7-28.

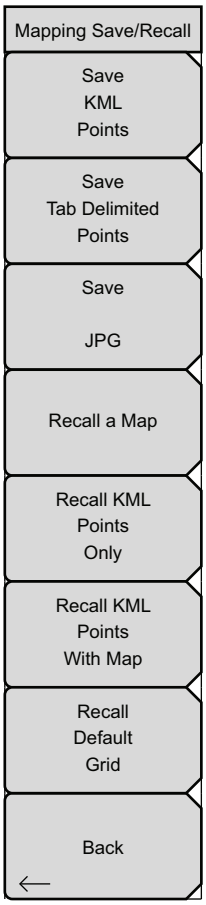
Back: Returns to the "Measurements Menu" on page 7-17.

Start/Stop Data Collection: 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.

Figure 7-22. AM/FM/PM Coverage Mapping Menu

Mapping Save/Recall Menu

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



Save KML Points: 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: Press this button to save the points in a tab delimited text file. FileName.mtd will be stored in the selected location.

Save JPG: Press the Save JPG key to save a .jpg file of the current screen.

Recall a Map: Opens the Recall menu for selecting a map created with the Anritsu easyMap tools program to display on the screen.

Recall KML Point: Opens the Recall menu for selecting a .kml file. Displays the saved locations overlaid on the default grid.

Recall KML Points With Map: 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.

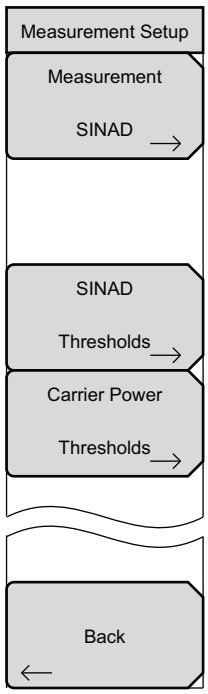
Recall Default Grid: If you do not have a GPS embedded map but are out in the field making measurements and would like to save the KML points, the Recall Default Grid submenu allows you to save points and the corresponding GPS coordinates to view at a later time.

Back: Returns to the “Coverage Mapping Menu” on page 7-25.

Figure 7-23. AM/FM/PM Mapping Save/Recall Menu

Measurement Setup Menu

Key Sequence: **Measure** or **(Shift + 4)** > Coverage Mapping > Measurement Setup



Measurement: Press this button to select coverage measurement. Choose between SINAD, Carrier Power or Both (Multiple). The button displays the current measurement selection.

SINAD Thresholds: Press this button to select the threshold values for SINAD measurements. Each threshold corresponds to a specific mapping point color during coverage mapping (Figure 7-4 on page 7-7). Threshold values can also be changed with the touch screen by pressing on one of the color boxes in the map legend.

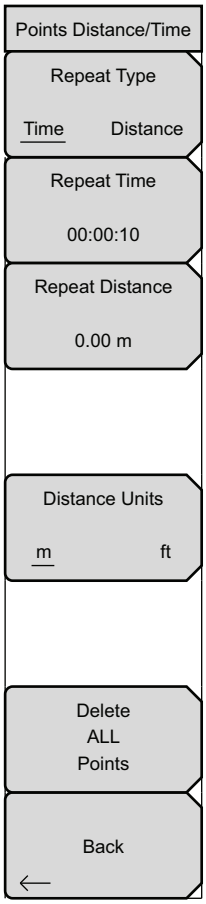
Carrier Power Thresholds: Press this button to select the threshold values for Carrier Power measurements. Each threshold corresponds to a specific mapping point color during coverage mapping. Threshold values can also be changed with the touch screen by pressing on one of the color boxes in the map legend.

Back: Returns to the "Coverage Mapping Menu" on page 7-25.

Figure 7-24. AM/PM/FM Coverage Mapping Measurement Setup Menu

Point Distance/Time Setup Menu

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



Repeat Type: Toggles between using a Time or Distance interval for capturing data.

Repeat Time: Sets the time interval when the Time is selected in the Repeat Type button.

Repeat Distance: Sets the distance interval when the Distance is selected in the Repeat Type button.

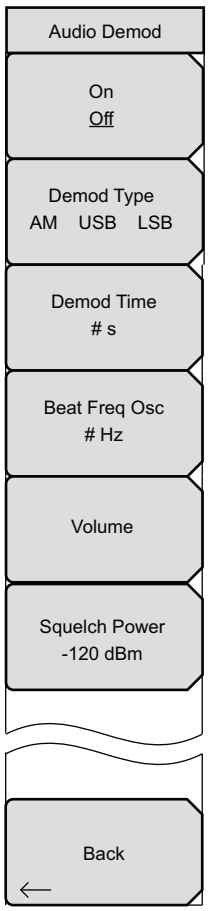
Distance Units: Toggles the unit of measure between meters and feet.

Back: Returns to the "Coverage Mapping Menu" on page 7-25.

Figure 7-25. Point Distance/Time Setup Menu

7-19 Audio Demod AM Menu

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



On Off: Press to turn On and Off the auto demodulation function. The current state (On or Off) is underlined on the submenu key.

Demod Type: Press to select the type of desired demodulation: AM, USB, or LSB. The selection toggles through the choices, and the current setting is underlined on the submenu key.

Demod Time: Press to set the demodulation time. If you use the numeric keypad to enter a value, then the submenu keys change to Time in units of min, s, ms, or µs. Demodulation time denotes the audio playback time. Audio playback and the graph display occur one after the other. For example, if the demodulation time is chosen as 3 seconds, then one complete sweep of graph display occurs followed by 3 seconds of audio playback, followed by one sweep of graph display, followed by 3 seconds of audio playback, and so on.

Beat Freq Osc: Sets the beat frequency of the oscillator to exactly set the demodulation frequency of USB and LSB signals. Displayed only when USB or LSB is selected as the Demod Type. This can also be used when demodulating CW (Morse code) signals.

Volume: Press to set the instrument speaker volume for listening to the demodulated signal.

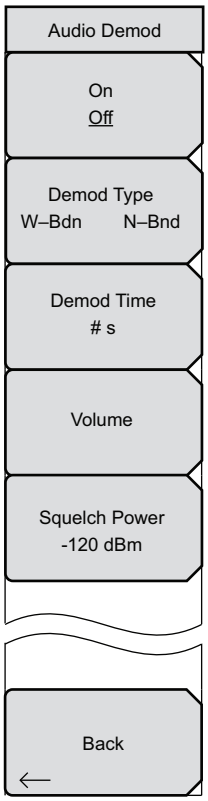
Squelch Power: Sets the squelch power value. Use this setting to limit noise in the displayed signal.

Back: Press to return to the Measurements menu.

Figure 7-26. Auto Demod AM Menu

7-20 Audio Demod FM Menu

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



On Off: Press to turn On and Off the auto demodulation function. The current state (On or Off) is underlined on the submenu key.

Demod Type: Press to select the type of desired demodulation: wideband (W-Bnd) or narrow band (N-Bnd). The selection toggles between the choices, and the current setting is underlined on the submenu key.

Demod Time: Press to set the demodulation time. If you use the numeric keypad to enter a value, then the submenu keys change to Time in units of min, s, ms, or µs. Demodulation time denotes the audio playback time. Audio playback and the graph display occur one after the other. For example, if the demodulation time is chosen as 3 seconds, then one complete sweep of graph display occurs followed by 3 seconds of audio playback, followed by one sweep of graph display, followed by 3 seconds of audio playback, and so on.

Volume: Press to set the instrument speaker volume for listening to the demodulated signal.

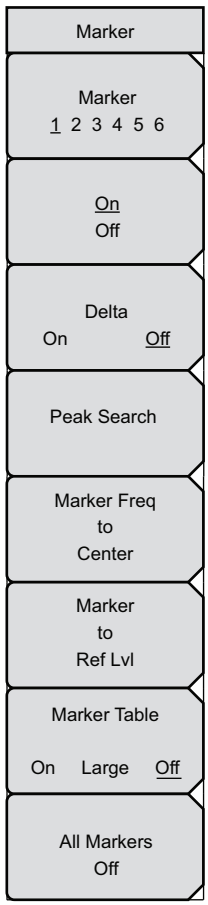
Squelch Power: Sets the squelch power value. Use this setting to limit noise in the displayed signal.

Back: Press to return to the Measurements menu.

Figure 7-27. Auto Demod FM Menu

7-21 Marker Menu

Key Sequence: **Marker**



Marker

1 2 3 4 5 6: Press to turn On a specific marker. The active (selected) marker is underlined on the submenu key.

On Off: Press to turn On and Off the selected marker. The current setting is underlined on the submenu key.

Delta

On Off: 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.

Peak Search: Press to place the currently active marker on the highest signal amplitude that is currently displayed in the sweep window.

Marker Freq to Center: Press to move the frequency that is noted by the active marker to the center frequency position and the center of the sweep window.

Marker to Ref Lvl: Press to set the amplitude of the currently active marker as the reference level, which is the top horizontal line in the sweep window.

Marker Table

On Large Off: Press to turn On or Off the marker table, which is displayed below the sweep window (Large is not functional in AM/FM/PM mode). 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.

All Markers Off: Press to turn Off all markers.

Figure 7-28. Marker Menu

Chapter 8 — Bias Tee (Option 10)

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

8-1 Introduction

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

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

The bias tee menu can be accessed from the applications options menu (**System** > Application Options) and in transmission measurement, it can also be accessed from the **Measure** main menu.

Refer to Figure 8-1 on page 8-2 for a sample TMA connection.

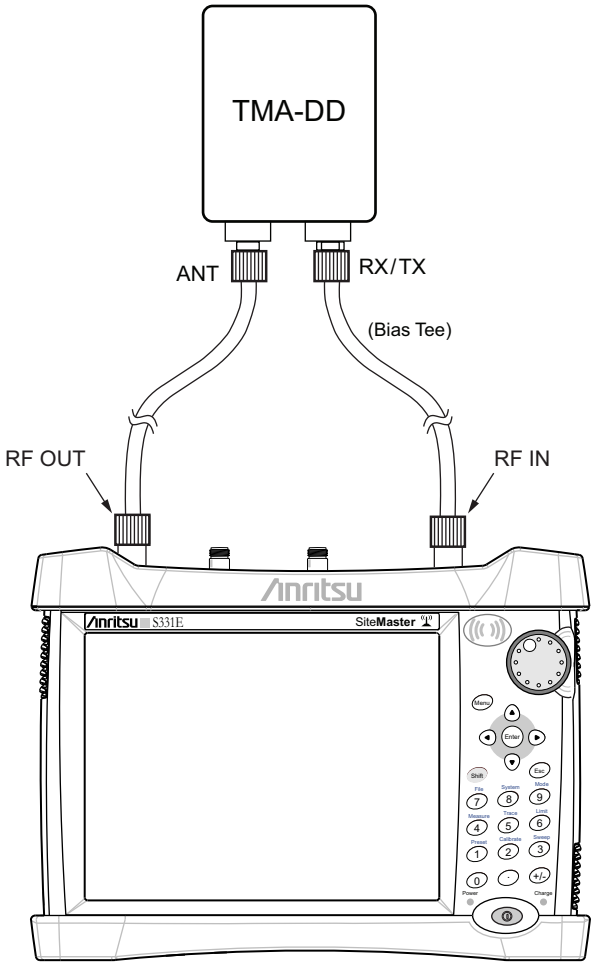


Figure 8-1. Variable Bias Tee

Chapter 9 — EMF (Option 444)

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

9-1 Introduction

Option 444 adds the EMF Measurement menu to the Spectrum Analyzer measurement mode. It must be used in conjunction with the Anritsu isotropic antenna, at a frequency range that is within specification of the instrument and antenna used. Refer to the isotropic antenna and spectrum analyzer technical data sheets.

9-2 Connecting the Antenna

1. Connect the antenna RF connector to the **Analyzer/RF In** port on the instrument. See Figure 9-1. The antenna connector must be *finger* tight.
2. Connect the antenna USB connector to one of the USB Type A ports on the instrument.

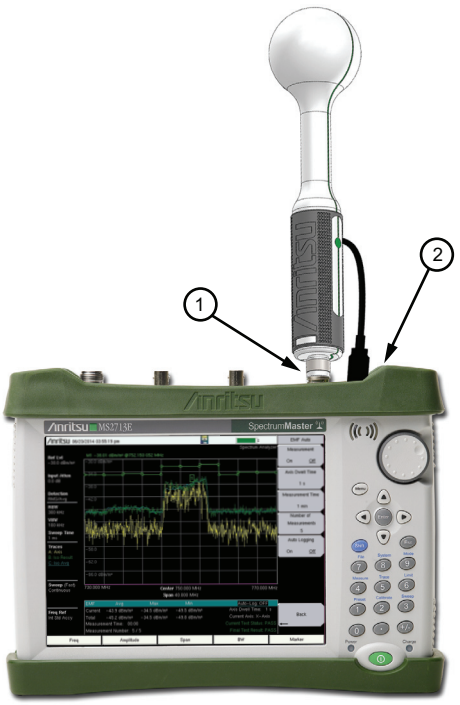
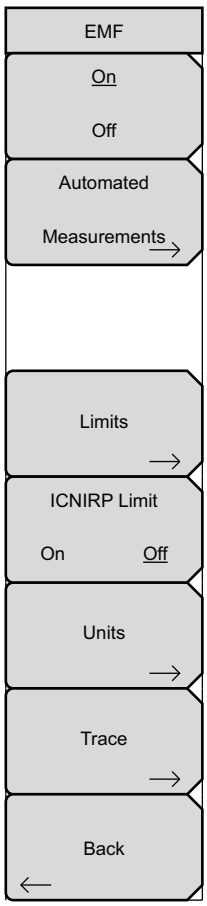


Figure 9-1. Connecting the Anritsu Isotropic Antenna

9-3 EMF Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Power and Bandwidth > EMF Measurement



On/Off: This is the main EMF Measurement On/Off button. Press this key to switch EMF On and Off. The start and stop frequencies must be within the frequency range of the spectrum analyzer and isotropic antenna used, and the antenna must be connected. The detection type is automatically changed to RMS/Avg when EMF is On. It is restored to the previous detection setting when EMF is Off.

Note: You are prompted with warning messages if the antenna is not connected or if the frequency range of the analyzer is outside the antenna range.

Automated Measurements: Opens the "EMF Auto Menu" on page 9-3 where you can set up EMF parameters and start the measurement. EMF must be turned On.

Limits: This is a shortcut to the standard spectrum analyzer **Limits** menu (**Shift** > **Limit** (**6**)). For EMF measurements, only the upper limit line is used for testing the pass/fail condition. Multi-segment limit lines can also be created.

ICNIRP Limit On/Off: Turning this On creates a limit line consistent with the guidelines of the International Commission on Non-Ionizing Radiation Protection. Trace C contains the averaged isotropic result and is tested against this limit line, and then the Pass/Fail status is updated.

Units: This is a shortcut to the standard spectrum analyzer **Units** menu (Under the Amplitude menu). When EMF Measurements is turned On, the labels are correctly updated to field strength units.

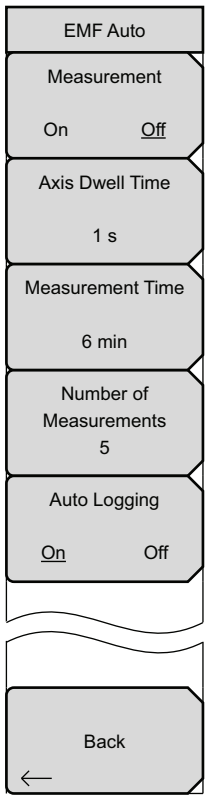
Trace: Opens the "Trace Menu" on page 9-4.

Back: Returns to the "Power and BW Menu" on page 2-58.

Figure 9-2. EMF Menu

EMF Auto Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Power and Bandwidth > EMF Measurement > Automated Measurements



Measurement On/Off: Starts the EMF Measurement. The Dwell Time, Measurement Time, and other related parameters must be set before starting the measurement. This button is useful for stopping or restarting measurements when settings need to be changed. When the measurement is in progress, access to other menus and key presses are blocked. The Measurement On/Off key is then the only key that can be accessed.

Measurement/Setup save is not permitted when EMF Automated Measurement is turned On. At the end of the measurement, the button will automatically be updated to Off and access to all menus restored.

Axis Dwell Time: Specifies the time spent on each axis. The sweeps are averaged and saved for further computation.

Measurement Time: Sets the measurement duration from one minute up to 30 minutes.

Number of Measurements: Sets the number of EMF measurements to complete from 1 up to 10,000.

Auto Logging On/Off: Auto Logging is On by default. This must be selected prior to starting the measurements for the results to be logged. The average, max, and min values of each measurement, the isotropic trace data, and the computed total average, max, and min values are saved in a tab delimited text file in internal memory.

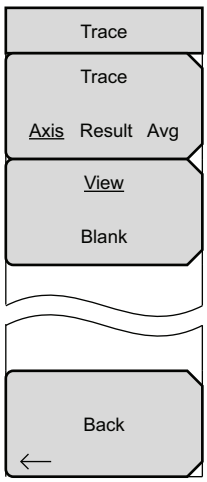
The location of this log file is a new folder named with the current time stamp followed by _1, and created in "/Internal Memory/EMF/". The folder can hold 100 files. Each file holds five measurements. The 101st file and the files created thereafter are stored in a new folder with the same time stamp as the first, followed by _2 (then _3, and so on). Each file has its own time stamp.

Back: Returns to the "EMF Menu" on page 9-2.

Figure 9-3. EMF Auto Menu

Trace Menu

Key Sequence: **Shift** > **Measure** (**4**) key > Power and Bandwidth > EMF Measurement > Trace



Trace: Selects one of three traces, each holding a different result.

Axis: Holds the sweep result for the currently selected axis.

Result: The isotropic result $(X^2+Y^2+Z^2)^{0.5}$ at the end of an X, Y, Z sweep.

Avg: Holds the averaged isotropic result. This is the running average of the individual isotropic measurements in a selected period (defined by the Measurement Time).

View/Blank: Toggles the selected trace between **View** and **Blank** state. Two or all three traces can be viewed simultaneously by selecting each trace and setting its state to **View**. Selecting **Blank** will blank the currently selected trace.

Back: Returns to the "EMF Menu" on page 9-2.

Figure 9-4. Trace Menu

9-4 Measurement Results

After completing the data collection for the three axes, the Isotropic Result is calculated and displayed. In addition to the three traces displayed on the user interface (Axis Sweep Data, Current Isotropic Result, and Average Isotropic Result/Measurement), the max, min, and average values of the Isotropic Result traces are also computed and displayed in the table below the graph region. The maximum, minimum, and average value of the Isotropic Results in the specific measurement is computed *(sum of the trace point amplitudes / 551)*. The values displayed are the max, min, and running average of all the Isotropic Results computed within a measurement period.

At the end of a measurement period, the current max, min, and average values are copied to the total max, min, and average values. The current values are then cleared for the next measurement. The total max, min, and average values displayed are the result of the isotropic numbers computed in the total EMF measurement period *(measurement time * number of measurements)*.

Pass/Fail

The limit check is done at the end of a measurement period. The limit line, if selected, is applied against the Avg trace. At the end of the measurement time (default 6 minutes) and if the trace exceeds the selected limit, a fail is recorded and the Current Test Status in the bottom table is updated to FAIL. The Final Test Result is also marked as a FAIL. If the Average Isotropic Result does not cross the limit line, then the Current Test Status is updated to PASS and stays this way for a few sweeps. The Current Test Status is then updated to "--". If all of the measurements pass, the Final Test Result is updated to PASS.

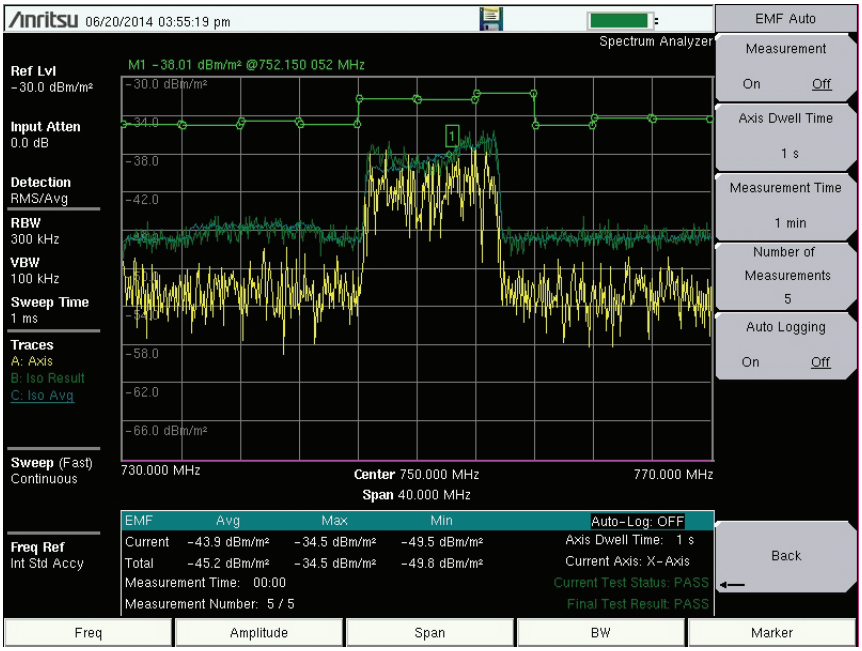


Figure 9-5. EMF Measurement Display

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