Measurement Guide

Spectrum Analyzer for Anritsu RF and Microwave Handheld Instruments

BTS Master[™] Site Master[™] Spectrum Master[™] Cell Master[™] LMR Master

Spectrum Analyzer	Included
S412E CW Generator	Included with the S412E LMR Master
Interference Analyzer	Option 25
Channel Scanner	Option 27
Zero-Span IF Output	Option 89
Gated Sweep	Option 90
CW Generator	Option 28
Coverage Mapping	Option 431
AM/FM/PM Analyzer	Option 509

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



TRADEMARK ACKNOWLEDGMENTS

Windows is a registered trademarks of Microsoft Corporation. BTS Master, Site Master, Cell Master, LMR Master, and Spectrum Master are trademarks of Anritsu Company. Google Maps and Google Earth are trademarks of Google Inc.

NOTICE

Anritsu Company has prepared this manual for use by Anritsu Company personnel and customers as a guide for the proper installation, operation and maintenance of Anritsu Company equipment and computer programs. The drawings, specifications, and information contained herein are the property of Anritsu Company, and any unauthorized use or disclosure of these drawings, specifications, and information is prohibited; they shall not be reproduced, copied, or used in whole or in part as the basis for manufacture or sale of the equipment or software programs without the prior written consent of Anritsu Company.

UPDATES

Updates, if any, can be downloaded from the Anritsu Website at: http://www.anritsu.com For the latest service and sales contact information in your area, please visit: http://www.anritsu.com/contact.asp

Safety Symbols

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

Symbols Used in Manuals

Danger



This indicates a 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.

Warning	Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced. Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.
Warning or	When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.
Warning	This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.
Caution	Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge. Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.
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.

Table of Contents

Chapter 1—General Information

1-1	Introduction
1-2	Contacting Anritsu
1-3	Anritsu Service Centers
1-4	Selecting a Measurement Mode
1-5	Connector Care 1-2 Connecting Procedure 1-2 Disconnecting Procedure 1-2
	Connectors

Chapter 2—Spectrum Analyzer

2-1	Introduction
2-2	General Measurement Setups 2-1
2-3	Making Spectrum Analyzer Measurements 2-2 Setting Bandwidth Parameters 2-2 Setting Sweep Parameters 2-3
2-4	Resolution Bandwidth
2-5	Video Bandwidth
2-6	Sweep Limitations
2-7	Attenuator Functions
2-8	Preamplifier Operation
2-9	Field Measurements
2-10	Field Strength 2-11 Antenna Calculations 2-12
2-11	Occupied Bandwidth Measurement
2-12	Channel Power Measurement
2-13	Adjacent Channel Power Measurement
2-14	Out-of-Band Spurious Emission Measurement
2-15	In-band/Out-of-Channel Measurements
2-16	In-band Spurious Measurement
2-17	AM/FM/SSB Demodulation
2-18	Carrier to Interference Ratio Measurement
2-19	Emission Mask

2-20	Coverage Mapping
2-21	Spectrum Analyzer Menus 2-25 Main Menu Key Menus 2-25 Sween Menus 2-26
	Measurement Menus
	Trace Menus
	Limit Menus
	System Menus
2-22	Freq (Frequency) Menu
2-23	Amplitude Menu 2-33 Detection Menu 2-34
2-24	Span Menu
	Span Menu (continued)2-36
2-25	Zero Span IF BW Menu2-37
2-26	Zero Span IF BW Menu (MS2723B/24B)2-38
2-27	BW (Bandwidth) Menu2-39
2-28	Marker Menu
	More Peak Options Menu
2-29	Sween Menu 2-43
	Sweep Mode Menu
	Trigger Menu
	Gate Setup Menu (Option 90)2-46
2-30	Measure Menu
	Field Strength Menu 2-48 OOO DW Muse 2-40
	OCC BW Menu 2-48 Channel Power Menu 2-49
	ACPR Menu
	AM/FM Demod Menu
	C/I Menu
	Measure 2/2 Menu
2-31	Trace Menu
	Trace A Ops Menu 2-55 Trace B Ops Manu 2-55
	тасе С Ops Menu 257

2-32	Limit Menu2-58Edit Menu2-60Edit Menu (continued)2-61Limit Move Menu2-62Limit Envelope Menu2-63Limit Advanced Menu2-65
2-33	Application Options Menu
2-34	Other Menus
Cha	pter 3—LMR Master CW Signal Generator
3-1	Introduction
3-2	Procedure
Cha	pter 4—Interference Analyzer (Option 25)
4-1	Introduction
4-2	General Measurement Setups
4-3	Spectrum
4-4	Spectrogram
4-5	Signal Strength
4-6	Received Signal Strength Indicator (RSSI)
4-7	Signal ID
4-8	Interference Mapping
	Anritsu easyMap Tools
	Instrument Settings
	Save the Interference Information
4-9	Interference Analyzer (IA) Menus
4-10	Freq (Frequency) Menu 4-24 Span Menu 4-26
4-11	Amplitude Menu 4-27 Detection Menu 4-28
4-12	BW (Bandwidth) Menu

4-13	Measurements Menu4-30
	Spectrum Menu4-31
	Field Strength Menu 4-32
	OCC BW Menu
	Channel Power Menu4-33
	ACPR Menu
	AM/FM Demod Menu4-35
	C/I Menu
	Measure 2/2 Menu
	Spectrogram Menu4-38
	Signal Strength Menu4-39
	RSSI Menu
	Signal ID Menu
	Interference Mapping Menu
	Mapping Save/Recall Menu4-43
4-14	Marker Menu
	More Peak Options Menu4-45
	Marker 2/2 Menu
4-15	Sweep Menu
	Sweep Mode Menu4-48
	Trigger Menu
	Gate Setup Menu4-50
4-16	Measure Menu
4-17	Trace Menu
	Trace A Ops Menu4-53
	Trace B Ops Menu4-54
	Trace C Ops Menu
4-18	Limit Menu
	Menu
	Edit Menu
	Edit Menu (continued)
	Limit Move Menu4-60
	Limit Envelope Menu4-61
	Limit Advanced Menu4-63
4-19	Application Options
4-20	Other Menus
Cha	pter 5—Channel Scanner (Option 27)
5-1	Introduction
5 0	Concerel Macourement Column

5-4	Custom Setup Measurements 5-3
5-5	Custom Setup Example
5-6	Script Master Measurement Setup 5-4
5-7	Channel Scanner (CHS) Menu Tree
5-8	Scanner Menu
	Channel Scan Menu
	Scan Script Master Menu
5-9	Amplitude Menu
5-10	Custom Scan Menu 5-12
5-11	Measurements Menu 5-13
5-12	Sweep Menu
5-13	Measure Menu
5-14	Trace Menu
5-15	Limit Menu
5-16	Other Menus
Cha	pter 6—CW Signal Generator (Option 28)
6-1	Introduction
	Required Equipment 6-1
6-2	Procedure
Cha	pter 7—Coverage Mapping (Option 431)
7-1	Introduction
7-2	General Measurement Setups
7-3	Spectrum Analysis Settings
7-4	Coverage Mapping
	Anritsu easyMap Tools
	Map the Signal Strength
	Save the Coverage Mapping Information
7-5	Coverage Mapping Menus
7-6	Coverage Mapping Menu
	Mapping Save/Recall Menu7-17
	Measurement Setup Menu
Cna	pter o—AW/FW/PWI Analyzer (Option 509)
8-1	Introduction

8-2	General Measurement Setup
8-3	Example FM Demodulation Measurement
8-4	AM/FM/PM Analyzer Menus
	Map of Main Menus8-5
	Map of Frequency Menus8-6
	Map of Measurements Menus8-7
	Map of Audio Demod Menus8-8
8-5	RF Freq (Frequency) Menu8-9
8-6	RF Span Menu8-10
8-7	(Signal) Standard List Menu8-11
8-8	Amplitude Menu
8-9	Setup Menu
8-10	Measurements Menu8-14
8-11	RF Spectrum Menu8-15
8-12	Audio Spectrum AM Menu8-16
8-13	Audio Waveform AM Menu8-17
8-14	Audio Spectrum FM Menu8-18
8-15	Audio Waveform FM Menu8-19
8-16	Audio Spectrum PM Menu8-20
8-17	Audio Waveform PM Menu8-21
8-18	Audio Demod AM Menu8-22
8-19	Audio Demod FM Menu8-23
8-20	Marker Menu
Арр	endix A—Error Messages
A-1	Introduction
A-2	Interference Analyzer Error Messages
A-3	Channel Scanner Error Messages

Index

Chapter 1 — General Information

1-1 Introduction

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

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

1-2 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 web site:

http://www.anritsu.com/

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

1-3 Anritsu Service Centers

For the latest service and sales information in your area, please visit the following URL:

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

and choose a country for regional contact information.

1-4 Selecting a Measurement Mode

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

1-5 Connector Care

The connectors on your instrument are described in the User Guide.

Visually inspect connectors for general wear, for cleanliness, and for damage such as bent pins or connector rings. Repair or replace damaged connectors immediately. Dirty connectors can limit the accuracy of your measurements. Damaged connectors can damage the instrument. Connection of cables carrying an electrostatic potential, excess power, or excess voltage can damage the connector or the instrument or both. Connection of cables with inadequate torque settings can affect measurement accuracy. Over torquing connectors can damage the cable, the connector, the instrument, or all of these items.

Connecting Procedure

1. Carefully align the connectors.

The male connector center pin must slip concentrically into the contact fingers of the female connector.

- 2. Push connectors straight together. Do not twist or screw them together.
- **3.** To tighten, turn the connector nut, not the connector body. Major damage can occur to the center conductor and to the outer conductor if the connector body is twisted.
- **4.** If you use a torque wrench, then initially tighten by hand so that approximately 1/8 turn or 45 degrees of rotation remains for the final tightening with the torque wrench.

Relieve any side pressure on the connection (such as from long or heavy cables) in order to assure consistent torque. Use an open-end wrench to keep the connector body from turning while tightening with the torque wrench.

Do not over torque the connector.

Disconnecting Procedure

- **1.** If a wrench is needed, then use an open-end wrench to keep the connector body from turning while loosening with a second wrench.
- 2. Complete the disconnection by hand, turning only the connector nut.
- 3. Pull the connectors straight apart without twisting or bending.

Connectors

The following torque specifications may apply to the connectors on your instrument. To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the Type-N connector. Do not overtighten the connector.

Type-N

The recommended torque is 12 lbf \cdot in to 15 lbf \cdot in (1.36 N \cdot m to 1.70 N \cdot m).

Туре-К

The recommended torque is 8 lbf in (0.9 N m or 90 N cm).

Type SMA

The recommended torque is 8 lbf \cdot in (0.9 N \cdot m or 90 N \cdot cm).

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, and attenuator functions. Section 2-9 through Section 2-18 cover field measurements including brief examples demonstrating field strength, occupied bandwidth, channel power, adjacent channel power ratio, and carrier to interference ratio (C/I) tests. Finally, Section 2-21 though Section 2-34 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.

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

2-3 Making Spectrum Analyzer Measurements

Required Equipment

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

Required Setup

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

Setting Bandwidth Parameters

Both resolution bandwidth (RBW) and video bandwidth (VBW) can be coupled to the frequency span automatically or manually set. When set to Auto RBW, RBW adjusts automatically in proportion to the frequency span. The default ratio of the span width to the resolution bandwidth is 300:1, 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 (for example, 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 (for example, the Auto RBW submenu key is toggled "Off"), the label and value turn red and a "#" symbol is shown in front of the RBW label. Adjust resolution bandwidth independently of the span. If an unavailable resolution bandwidth is entered, then the instrument selects the next higher resolution bandwidth. If a value greater than the widest RBW is entered, then the widest RBW will be selected.

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

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

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

Setting Sweep Parameters

To set the sweep parameters, press the \mathbf{Shift} key and then the \mathbf{Sweep} (3) key.

Single/Continuous

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

Sweep Mode

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

Note Fast is the default sweep mode for instruments that have received the New Instrument calibration from Anritsu.

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 data is shown at each display point.

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

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

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.

Trigger Type

To select a specific type of triggering in zero span, press the **Trigger Type** submenu key. Selections are:

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

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

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

Change Trigger Position: This submenu key is used in conjunction with video triggering to set the horizontal position on the display where a signal that meets the video triggering criterion will be placed. The value can be from 0 % to 100 %. Zero percent places the triggering event at the left edge of the screen while 100 % places the triggering at the right edge of the screen. When the trigger position is any value other than 0 %, the portion of the trace before the trigger event is displayed very quickly because the trace data is stored in memory. The portion of the trace after the trigger point is painted on the screen at the normal rate as the signal is swept.

Gated Sweep Setup (Option 90 Only): The Gated Sweep function allows you to view a signal in time and frequency domain. Pressing the **Gated Sweep Setup** splits the screen into two graphic displays, frequency domain (top) and time domain (bottom). In addition, the Gate Setup menu is listed for setting up the parameters for Gated Sweep: gate polarity, gate delay, gate length, and zero span time. In reference to the time domain display, zero time span is the time set for the full horizontal length of the screen, the gate delay sets the left vertical blue line or start of the gate sweep, and the gate length sets the right vertical blue line or end of the gate sweep. The gated sweep signal is displayed in frequency domain on the top graphic display.

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



Figure 2-1. Gated Sweep Setup

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. The IF output signal is present only when the instrument Span is set to zero and the Zero Span button has been pressed a second time to bring up the IF bandwidth menu (**Span** > Zero Span > Zero Span). 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 instrument 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.

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 .
	Option 89 is not available for MS2721B instruments.

Zero Span IF output effectively uses the instrument as a receiver front-end, converting the input signal at the instrument 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 other signal processing. 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). Note that the IF output bandwidth of the MS2723B and MS2724B Spectrum Masters is limited to 16 MHz, and their Zero Span IF BW menu has no 32 MHz BW submenu key.



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 instrument has several mixer bands. Depending on the operating frequency, the local oscillator may be above or below the input frequency. When the local oscillator (LO) 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, and the IF output 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.

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

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

"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 first and second local oscillators. Usually this offset will be on the order of several kHz. To determine the residual offset, use the following procedure:

- **1.** Attach a signal source (or antenna) to the instrument and set the center frequency to the center of the signal being received.
- 2. Press BW then Zero Span and 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.

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 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 3 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 Min Sweep Time submenu key. Enter a sweep time from 10 μ s to 600 seconds. If the minimum sweep time entered by the user is less than the value needed to assure accurate results, the value that delivers accurate results will be used. Regardless of the minimum sweep time setting, the instrument will never sweep faster than the RBW and VBW settings will allow. The instrument is designed to ensure that no uncalibrated measurement conditions will occur.

2-7 Attenuator Functions

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

2-8 Preamplifier Operation

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

Preamplifier Measurement Example

Figure 2-3 and Figure 2-4 show the same signal with the preamplifier off and then on. Notice that when the preamplifier is turned on, the noise floor drops significantly allowing spectral regrowth components that were lost in the noise without the preamplifier to become easily visible.



Figure 2-3. Preamplifier Off



Figure 2-4. Preamplifier On

2-9 Field Measurements

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

2-10 Field Strength

Required Equipment

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

Procedure

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

Select an antenna from the standard list available or use the Antenna EditorNote 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 RBW Auto and VBW Auto 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, $dB\mu V/m$, Volt/m, Watt/m², dBw/m^2 , A/m, dBA/m, or Watt/cm². 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 μ V = 10^{-6} V.

For power in dBm, and voltage in dB (μ V):

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

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/m²

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_r = gain of transmitting antenna r = distance from the antenna in meters

2-11 Occupied Bandwidth Measurement

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

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

Required Equipment

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

Procedure

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

Figure 2-5 shows the occupied bandwidth results using the percent of power method on a CDMA 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

2-12 Channel Power Measurement

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

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

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

Channel Power Measurement for GSM

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

Required Equipment

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

Procedure

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

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

2-13 Adjacent Channel Power Measurement

Required Equipment

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

Procedure

- 1. Using the test port extension cable and 30 dB attenuator, connect the signal source to the input of the attenuator, and connect the output of the attenuator to the RF In test port.
- 2. If an attenuator was connected in Step 1, press the RL Offset submenu key and set the reference level offset to -30 dB to compensate for the loss of 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 LvI 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 **RBW** Auto and VBW Auto 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 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.

2-14 Out-of-Band Spurious Emission Measurement

Required Equipment

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

Procedure

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

10. Repeat Step 8 and Step 9 for the remaining spurs. Use either Marker 1 again, or choose another marker. Figure 2-6 shows a simulated out-of-band spurious signal 3 MHz from the carrier using a delta marker.



Figure 2-6. Out-of-Band Spurious Emission Measurement

2-15 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

2-16 In-band Spurious Measurement

Required Equipment

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

Procedure

- 1. Using the test port extension cable and 30 dB, 50 watt, (Bi-directional) attenuator, connect the RF In port to the appropriate transmit test port.
- 2. Press the **Freq** main menu key, press the **Center Freq** submenu key, and enter the center frequency.
- **3.** Press the **Span** main menu key. Set the span wide enough to include the primary channel bandwidth and upper and lower channel bandwidths.
- 4. Press the **Amplitude** main menu key and then press the **Reference Level** submenu key to set the reference level to -20 dBm.
- 5. Press the RL Offset submenu key to set the reference level offset to -30 dB to compensate for the loss of 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 Step 9 and Step 10 for the remaining spurs. Use either Marker 1 again, or choose another marker.

2-17 AM/FM/SSB Demodulation

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

Procedure

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

2-18 Carrier to Interference Ratio Measurement

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

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

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

Procedure

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

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 2-7), with the carrier measured (Figure 2-8), and the measurement results (Figure 2-9).



Figure 2-7. C/I Measurement, Ready to Measure the Carrier



Figure 2-8. C/I Measurement, Carrier Measured


Figure 2-9. C/I Measurement, Results

2-19 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 2-32 "Limit Menu" on page 2-58 for details on the Limit menu.
- 2. Press the Shift key followed by the Measure (4) key and the More submenu key.
- 3. .Press the Emission Mask submenu key and turn On Emission Mask.



Figure 2-10.

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

2-20 Coverage Mapping

Refer to Chapter 7, "Coverage Mapping (Option 431)".

2-21 Spectrum Analyzer Menus

Figure 2-11 though Figure 2-16 show a 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 on the following pages).

Main Menu Key Menus



Figure 2-11. Main Menu Keys

Sweep Menus



Figure 2-12. Sweep Submenu Keys

Measurement Menus



Figure 2-13. Measure Menu Submenu Keys

Trace Menus



Figure 2-14. Trace Menu Submenu Keys

Limit Menus



Figure 2-15. Limit Menu Submenu Keys

System Menus



Figure 2-16. System Menu, Application Options Menu Submenu Keys

2-22 Freq (Frequency) Menu

Key Sequence: Freq

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



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

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

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

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

Span: Press the **Freq** main menu key followed by the Span submenu key and enter the desired span. The Span menu is used to set the frequency range over which the instrument will sweep. The span can be set from 10 Hz to the maximum frequency range the product will support. See the product specifications for the maximum frequency. Span can also be set to zero span.

The submenu key shows the current value for span in units of GHz, MHz, kHz, or Hz. When the Span button is pressed, span becomes the active parameter and may be changed. Use the keypad, the directional arrow keys, or the rotary knob to increase or decrease the span frequency. If the span is changed using the arrow keys, the span changes in 1-2-5 steps for each key press. See "Span Menu" on page 2-35.

Figure 2-17. SPA Frequency Menu (1 of 2)

Freq (Frequency) Menu (Continued)





2-23 Amplitude Menu

Key Sequence: Amplitude



Reference Level: The reference level is the top graticule line on the display, and can be set from +30 dBm to -130 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/Down** arrow keys change the reference level in 10 dB steps, and the **Left/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 LvI: Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.

RL Offset On/Off: Reference Level Offset compensates for the presence of an external input attenuation or gain. Enter a positive value to compensate for an external amplifier, or a negative value to compensate for an external attenuator. Use the ± key to enter the negative sign when a negative attenuation value is being entered.

Units: Select the display units from this submenu key. Units may include:

dBm, dBV, dBmV, dBµV, Volt, A, or Watt, and in field strength measurements: dBm/m², dBv/m, dBmV/m, dBµV/m, Volt/m, Watt/m², dBW/m², A/m, dBA/m, Watt/cm²

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 selecting which measurement point will be shown at each display point. Opens the "Detection Menu" on page 2-34.



Detection Menu

Key Sequence: **Amplitude** > Detection

Detection	Peak: This method causes the largest measurement point to be shown for each display point, assuring that a narrow peak is not missed.
Peak	RMS: This method performs a root-mean-square calculation of all the measurement points in each display point, and is particularly useful in displaying the average value of noise.
	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
○) Negative	points that contain only noise will tend to show lower amplitudes than those that contain discrete signals.
Sample	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.
Quasi-peak	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.
	Back: Returns to the "Amplitude Menu" on page 2-33.
Back	

Figure 2-20. SPA Detection Menu

2-24 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



Figure 2-21. SPA Span Menu (1 of 2)

Span Menu (continued)

Span Span	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
1.000 MHz	if information about the amplitude of an 802.11a access point signal is
Span Up	needed, the access point frequency would be set as the center frequency,
1-2-5	much of the signal as possible and the tester would walk around the access
Span Down	point usable area while the instrument records the amplitude using slow sweep.
1-2-5	Zero Span (Option 89): Zero Span IF Output provides a 37.8 MHz or
Full Span	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 one of three (or four) fixed IF bandwidths in addition to the bandwidths that are set by the PRW filters that are built into the instrument. Fixed IF bandwidths are
Zero Span	4 MHz, 10 MHz, or 16 MHz in all instruments that have IF output, or 32 MHz, which is available in the MS272xC series of Spectrum Masters. See Figure 2-23 on page 2-37 for bandwidths.
Last Span	You can also select Normal. When Normal is selected, the IF bandwidth is influenced by the selected RBW filter and can be set to any value from 10 MHz to 1 Hz for the MS272xC and 1 MHz to 1 Hz for the MS2723B and MS2724B. The bandwidths are significantly wider than the selected RBW
	filter value because the digital RBW filters are not being used. Only physical bandpass filters are being used, which limit the bandwidth and reduce out-of-band interference. This is not the usual way to use IF output.
Back	Refer to "Zero Span IF Output (Option 89)" on page 2-5.
	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 2-22. SPA Span Menu (2 of 2)

2-25 Zero Span IF BW Menu

Option 89, Zero Span IF Output

The IF output signal is nominally at 140 MHz and is present only when the instrument Span is set to zero, and the Zero Span button has been pressed a second time to bring up the Zero Span IF BW menu. Refer to "Zero Span IF Output (Option 89)" on page 2-5.

Key Sequence: Span > Zero Span > Zero Span



Figure 2-23. Zero Span IF BW Menu

2-26 Zero Span IF BW Menu (MS2723B/24B)

Option 89, Zero Span IF Output

The IF output signal is nominally at 37.8 MHz and is present only when the instrument Span is set to zero, and the Zero Span button has been pressed a second time to bring up the Zero Span IF BW menu. Refer to "Zero Span IF Output (Option 89)" on page 2-5.

Key Sequence: **Span** > Zero Span > Zero Span

Zero Span IF BW	Normal: 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 IF bandwidth is influenced by the selection of RBW filters, although the digital RBW filters themselves are not employed.
7 MHz BW	7 MHz BW: Sets the IF output bandwidth to 7 MHz.
O 10 MHz BW	10 MHz BW: Sets the IF output bandwidth to 10 MHz.
O 16 MHz BW	16 MHz BW: Sets the IF output bandwidth to 16 MHz.
Back	Back: Returns to the previous menu



2-27 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 is 10 Hz to 3 MHz in a 1-3 sequence, from 10 Hz to 30 Hz to 100 Hz, and so on.

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 3 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.

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 300, meaning that the span width is approximately 300 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 7.1 GHz. 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 2-25. SPA Bandwidth Menu

2-28 Marker Menu

Key Sequence: Marker

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

Marker (1/2)	
Marker	Marker: Selects the active marker (1 to 6). The underlined marker number is the active marker.
<u>On</u>	On/Off: Turns the selected marker underlined in the Marker submenu key On or Off.
Off Delta	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.
On <u>Off</u>	Peak Search: This key places the currently active marker on the highest signal amplitude currently displayed on screen.
Peak Search	Marker Freq to Center: Moves the frequency noted by the active marker to the center frequency position and center of the display.
Marker Freq to Center	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.
Marker to Ref Lvl	More Peak Options: Brings up a secondary menu of submenu keys for more peak searching options. See the "More Peak Options Menu" on page 2-41.
More Peak Options →	More: Opens a submenu of additional Marker options. See the "Marker 2/2 Menu" on page 2-42.
More \rightarrow	

Figure 2-26. SPA Marker (1/2) Menu

More Peak Options Menu

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



Figure 2-27. SPA Marker & Peak Menu

Marker 2/2 Menu

Key Sequence: Marker > More

Marker (2/2) Marker Noise	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.
On <u>Off</u> Market Table On <u>Off</u>	Marker Table On/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.
Air Markers	All Markers Off: Turns off all markers.
Off Counter Marker On <u>Off</u> Set Marker	Counter Marker On/Off: Sets the frequency counter mode for all markers. 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 within the pixel to a resolution of 0.001 Hz.
to Channel Marker Style	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.
Fixed <u>Tracking</u> Marker 1 Reference	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.
Back	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 2-40.

Figure 2-28. SPA Marker (2/2) Menu

2-29 Sweep Menu

Key Sequence: Shift > Sweep (3) key



Opens the "Gate Setup Menu (Option 90)" on page 2-46.

Figure 2-29. SPA Sweep Menu

Sweep Mode Menu

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

Sweep Mode	This menu sets the current sweep mode. Select one of the three Sweep
0	Fast: Fastest sweep speed.
Fast	Performance: Provides best amplitude accuracy and ensures all specifications are met.
Performance	No FFT: Slowest sweep speed. Ideal for analog and pulse modulated signals.
O No FFT	Show Help: Display a table showing the merits and tradeoffs of the three Sweep Mode settings.
	Back: Returns to the "Sweep Menu" on page 2-43.
Show Help	
Back	

Figure 2-30. SPA Sweep Mode Menu

Trigger Menu

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



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

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

Change Trigger Position: This submenu key is used in conjunction with video triggering to set the horizontal position on the display where a signal that meets the video triggering criterion will be placed. The value can be from 0 % to 100 %. Zero percent places the triggering event at the left edge of the screen while 100 % places the triggering at the right edge of the screen. When the trigger position is any value other than 0 %, the portion of the trace before the trigger event is displayed very quickly because the trace data is stored in memory. The portion of the trace after the trigger point is displayed on the screen at the normal rate as the signal is swept. This mode is used in Zero Span.

Manual Trigger: This submenu key can be used in zero span to immediately trigger a sweep when the trigger type is set to External or Video.

Back: Returns to the "Sweep Menu" on page 2-43.

Figure 2-31. SPA Trigger Menu

Gate Setup Menu (Option 90)

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

Gate Setup	
Gated Sweep	Gated Sweep
On <u>Off</u>	On Off: Turns the Gated Sweep function On and Off.
Gate Source	Gate Source External: (Currently Not Used)
External	Gate Polarity Rising Falling: Press to select the desired edge trigger to begin the gated
Rising Falling	Gate Delay: Sets the start of the gated sweep indicated by the left blue line on the bottom graph.
Gate Delay	Gate Length: Sets the time of the gated sweep indicated by the right blue line on the bottom graph.
Gate Length	Zero Span Time: Use this submenu key to set the time for the full length horizontal sweep of the time domain (bottom) graph.
500 us	Back: Returns to the "Sweep Menu" on page 2-43.
Zero Span Time	
300 ms	
\leftarrow Back	
	1

Figure 2-32. SPA Gated Sweep Menu

2-30 Measure Menu

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

Measure	
Field	Field Strength: This measurement allows the use of an antenna with known
$Strength \to /$	gain characteristics and measures the field strength over the frequency range
OCC BW	volts/meter or watts/meter. Opens the "Field Strength Menu" on page 2-48.
	OCC BW: Opens the "OCC BW Menu" on page 2-48. Select either % or dBc method of occupied bandwidth measurement.
	Channel Power: Activates the Channel Power measurement function. Channel Power and Channel Power Density are measured based on the selection in the Units menu. Opens the "Channel Power Menu" on page 2-49.
$\begin{array}{c} \text{ACPR} \\ \longrightarrow \end{array}$	ACPR: Accesses a menu of Adjacent Channel Power Ratio measurement options. See the "ACPR Menu" on page 2-50.
AM/FM Demod →	AM/FM Demod: The user can select AM, Narrow Band FM (300 μs de-emphasis), Wide Band FM (50 μs de-emphasis), Upper Sideband or Lower Sideband. See the "AM/FM Demod Menu" on page 2-51.
	C/I: The Carrier to Interference ratio is a two-step measurement sequence that first measures the amplitude of a carrier, then, with the carrier turned off, measures the amplitude of all other interfering signals within the channel bandwidth. See the "C/I Menu" on page 2-52.
Measurement Off	Measurement Off: Turns the measurement off.
\vdash	More: Opens the "Measure 2/2 Menu" on page 2-53.
More	
$ \longrightarrow $	

Figure 2-33. SPA Measure Menu

Field Strength Menu

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

F Strength On	On/Off . Turns field strength measurements on or off
Off	Antenna: This submany key brings up a dialog bey that lists all the antennas
Antenna	for which the instrument has data, including both standard antennas and custom antennas that have been added using Master Software Tools. Use the Up/Down arrow keys or the rotary knob to select the desired antenna and press Enter .
	Back: Returns to the "Measure Menu" on page 2-47.
Back	

Figure 2-34. SPA Field Strength Menu

OCC BW Menu

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



Figure 2-35. SPA OCC BW Menu

Channel Power Menu

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

Channel Pwr	On/Off: Begins or ends the channel power measurement. When the					
On	measurement is on, Ch Pwr will appear below the display. The detection					
Off	method will automatically be changed to RMS Average when the measurement is started. The detection method can be modified by pressing					
Center Freq	the Shift and the Sweep keys and pressing the Detection submenu key.					
1.939 900 GHz	Center Freq: Activates the center frequency function, and sets the center frequency of the instrument for the channel power measurement. Use the					
Ch Pwr Width	keypad, the directional arrow keys, or the rotary knob to enter the center					
24.960 MHz	requency. The Up/Down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu". The Left/Right arrows change					
Span	the frequency by 10 % of the span.					
24.960 MHz	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.					
	step value. The Left/Right arrow keys change the Channel Power Width by the frequency step value. The Left/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	Back: Returns to the "Measure Menu" on page 2-47.					



ACPR Menu

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

	On/Off: Begins or ends the ACPR measurement.
ACPR	Main Ch BW: Sets the bandwidth of the main channel for ACPR
On	measurement. Use the keypad, the directional arrow keys, or the rotary knob
Off	to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input.
Main Ch BW	Changing this value automatically changes the adjacent channel bandwidth and channel spacing.
8.320 MHz	Adi Ch BW: Sets the bandwidth of the adjacent channels for ACPR
Adj Ch BW	measurement. Use the keypad, the directional arrow keys, or the rotary knob
8.320 MHz	the GHz, MHz, kHz, or Hz submenu key to accept the frequency input.
Ch Spacing	Ch Spacing: Sets the channel spacing between the main and adjacent
8.320 MHz	channels. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press
Span	the GHz, MHz, kHz, or Hz submenu key to accept the frequency input. This
24.960 MHz	plus half of the adjacent channel bandwidth. The Up/Down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu". The Left/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 ←	Back: Returns to the "Measure Menu" on page 2-47.

Figure 2-37. SPA ACPR Menu

AM/FM Demod Menu

	·
	On/Off: Turns AM/FM Demodulation on or off.
AM/FM Demod	Demod Type: Provides submenu keys to select the type of signal to be
On	demodulated:
Off	FM Wide Band
Demod Type	AM USB LSB
Demod Freq	Demod Freq: Use the keypad, the directional arrow keys, or the rotary knob
10.350 MHz	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
Demod Time	instrument is set.
3 s	Demod Time: Use the keypad, the directional arrow keys, or the rotary knob
Set Demod Freg	to increase or decrease the demodulation time, and press the Enter key to
to Current	Select. The demodulation time can be set from 100 milliseconds to
Marker Freq	period. Sweeping pauses during the demodulation time.
Beat Freq Osc	Set Demod Freq to Current Marker Freq: Sets the demodulation
0 Hz	frequency to the frequency of the current marker.
	Beat Freq Osc: Sets the beat frequency of the oscillator to exactly set the
Volume	demodulation frequency of USB and LSB signals.
	Volume: The current volume setting is displayed on the screen. Use the
Back	Up/Down arrow keys or rotary knob to change the volume, and press the Enter key to select.
\leftarrow	Back: Returns to the "Measure Menu" on page 2-47.





C/I Menu

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



Figure 2-39. SPA C/I Menu

Measure 2/2 Menu

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



Figure 2-40. SPA Measure 2/2 Menu

2-31 Trace Menu

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

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



Figure 2-41. SPA Trace Menu

Trace A Ops Menu

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

Trace A Ops	
Normal -> A	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.
Max Hold -> A	Min Hold -> A: Shows the cumulative minimum value of each display point over many trace sweeps.
Min Hold -> A	Average -> A: Shows an exponential average of a number of traces, determined by the # of Averages key.
Average -> A	# 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 2-54.
# of Averages	
10	
Back	
\leftarrow	

Figure 2-42. SPA Trace A Ops Menu

Trace B Ops Menu

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

Trace B Ops	
A -> B	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.
B <-> C	Max Hold -> B: Shows the cumulative maximum value of each display point over many trace sweeps.
Max Hold -> B	Min Hold -> B: Shows the cumulative minimum value of each display point over many trace sweeps.
O Min Hold -> B	Back: Returns to the "Trace Menu" on page 2-54.
Back	

Figure 2-43. SPA Trace B Ops Menu

Trace C Ops Menu

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

ļ	Trace C Ops	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.
	A C	Max Hold -> C: Shows the cumulative maximum value of each display point over many trace sweeps.
	B <-> C	Min Hold -> C: Shows the cumulative minimum value of each display point over many trace sweeps.
	Max Hold -> C	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.
	Min Hold -> C	When trace math is active, a relative scale shows on the right side of the graph, and is associated to Trace C. This allows the user to optimize the display of Trace C without affecting the display of Traces A and B.
	О А-В -> С	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
	О В-А->С	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.
ĺ	Relative Ref	Relative Ref: Sets the value applied to the top graticule for the relative scale
	10.0 dB	this value by using the rotary knob, Up/Down arrows, or entering the value on
Ì	Relative Scale	the numeric keypad and pressing the dB submenu key or the Enter key. This entry is valid only when trace math is active
Į	10 dB/div	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/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 2-54.

Figure 2-44. SPA Trace C Ops Menu

2-32 Limit Menu

Key Sequence: Shift > Limit (6) key

The Limit menu keys are shown in the following figures.

Two types of limit lines can be specified, lower limit lines and upper limit lines. Limit lines can be used for visual reference only, or for pass/fail criteria using the limit alarm (Figure 2-45). Limit alarm failures are reported whenever a signal is above the upper limit line or below the lower limit line. By using save-on-event, a signal that causes a limit alarm can be automatically saved. See the User Guide for details.
Each limit line can consist of a single segment, or as many as 40 segments across the entire frequency span of the instrument. These limit segments are retained regardless of the current frequency span of the instrument, which allows the configuring of specific limit envelopes at various frequencies of interest without having to re-configure them each time the frequency is changed.





Edit Menu

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

Edit
Frequency
1.964 718 182 GHz
Amplitude
-75.0 dBm
Add
Point
Add
Vertical
Delete
Point
Next
Point
Left
Next
Point
Right
Back

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/Right** arrow keys, or the rotary knob to change the frequency of an inflection point. The **Left/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 \pm key to set a negative value), the **Up/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/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 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 2-46. SPA Limit Edit Menu (1 of 2)
```

Edit Menu (continued)

Edit	Add Vertical: In many measurement masks, step changes occur in the
Frequency	The two inflection points share the same frequency and are centered
1.964 718 182 GHz	are set by using a visually intuitive algorithm that is based upon the adjacent inflection points.
Amplitude	
-75.0 dBm	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
Add	frequency, a limit inflection point will keep that exact frequency and place the limit point appropriately regardless of the frequency span. This is especially
Point	useful for emission mask verification.
Add	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
Vertical	that was deleted.
Delete	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.
Point	active for editing or deletion. With each key press, the active point becomes
Next Point	active point becomes the left-most point on the screen.
Left	Next Point Right: Press this submenu key to select the limit point
Next Point Right	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	Back: Press this submenu key to return to the "Limit Menu" on page 2-58.

Figure 2-47. SPA Limit Edit Menu (2 of 2)

Back

 \leftarrow

Limit Move Menu

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

	Move Limit to Current Center Freq: Pressing this submenu key moves the
Limit Move	center of the existing limit line to the center frequency of the measurement.
Move Limit	The span of the existing limit line is not changed by doing this. Use this
to Current	submenu key as an easy way to get an existing limit line on screen. If no limit
Center Freq	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
Move Limit	from the bottom of the screen for the lower limit line.
0.0 dB	Move Limit ## dB: If the limit line is flat, then use this submenu key to move
Move Limit	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
0 Hz	number of dB. Use the keyboard to enter the desired value. The entire line
Move Limit	using the rotary knob. Turn the rotary knob clockwise to move the line to
to Marker 1	higher power levels. The Up/Down arrows move the limit line by 5 % of the screen height. The Left/Right arrows move the limit line by 0.2 % of the
Offset from Marker 1	screen height or 0.2 dB when the scale is set to 10 dB/division.
10.0 dB	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/Right arrows move the limit line by 5 % of the span while the Up/Down arrows move the line by one display pixel.
Back	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 1submenu 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 2-58.

Figure 2-48. SPA Limit Move Menu

Limit Envelope Menu

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



Figure 2-49. SPA Limit Envelope Menu



Figure 2-50. Square Limit Envelope



Figure 2-51. 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 2-58.



2-33 Application Options Menu

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



Figure 2-53. SPA Application Options

2-34 Other Menus

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

Chapter 3 — LMR Master CW Signal Generator

Note The information in this chapter *ONLY* applies to the LMR Master S412E. Instruments with Option 28, CW Generator should refer to Chapter 6.

3-1 Introduction

This chapter presents information on the operation of the LMR Master S412E CW Signal Generator.

The CW Signal Generator provides a continuous wave (CW) signal from the Signal Generator Out port of the instrument.

3-2 Procedure

- 1. On the instrument, press the Menu key and select the CW Signal Generator icon.
- 2. Press the **Freq** main menu key to set the desired transmit frequency using the **Tx Freq** submenu button.
- **3.** Press the **Amplitude** main menu key and set the power level using the **Power Level** button. The maximum power output for the LMR Master is 0 dBm (1.0 milliwatt). Adjust for any external attenuation or gain using the **Offset** submenu button.
- 4. Press the Turn Sig-Gen ON main menu button to start the CW Signal Generator.



Figure 3-1. CW Signal Generator Turned On

Chapter 4 — Interference Analyzer (Option 25)

4-1 Introduction

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

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

- Section 4-4 "Spectrogram" on page 4-2
- Section 4-5 "Signal Strength" on page 4-4
- Section 4-6 "Received Signal Strength Indicator (RSSI)" on page 4-5
- Section 4-7 "Signal ID" on page 4-6
- Section 4-8 "Interference Mapping" on page 4-9

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.

4-2 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.

4-3 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.

4-4 Spectrogram

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

Required Equipment

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

Required Setup

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

Procedure

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

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

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 can be automatically saved when the display is full. Press the Auto Save submenu key to toggle auto save On or Off.
- **9.** The Time Cursor submenu key is used to turn on the horizontal time cursor. Use the **Up/Down** arrow key to move the cursor vertically through the spectrogram. The date and time that the measurement at the cursor position was taken is displayed at the top of the screen.

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

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

NoteScreen 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 4-1. Interference Analyzer Spectrogram

4-5 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 by using a directional antenna.

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

Procedure

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

- 1. Connect the appropriate directional antenna to the RF In port and press the **Measurements** main menu key.
- 2. Press the Signal Strength submenu key to display the Signal Strength Meter. Press the Signal Strength submenu key again to open the Signal Strength menu.
- **3.** Press the Auto **Scale** submenu key to automatically scale the display range, or set the desired maximum and minimum values by pressing the **Max Level** and **Min Level** submenu keys.
- 4. Press the Speaker On/Off submenu key to turn on the audio output.

5. If necessary, press the Volume submenu key to set the speaker or headphone volume to a comfortable level. Use the **Up/Down** arrow keys to adjust the volume.



Figure 4-2. Interference Analyzer Signal Strength

4-6 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 Auto Save 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 4-3. Interference Analyzer RSSI

4-7 Signal ID

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

Procedure

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

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

To view the Signal ID data of a single frequency.

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

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



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



Figure 4-5. Interference Analyzer Signal ID, Freq Scan Type

4-8 Interference Mapping

	Interference Mapping requires Option 31, GPS.
Note	Interference Mapping is available only in the following instruments: S3x2E, S412E, MS271xE, MS272xC, and MT821xE.

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 special maps compatible with the Anritsu handheld instruments. The software imports maps from any map provider and creates files with or without GPS information. The files will have a .map extension. Anritsu easyMap Tools is shipped with the instrument on a CD and is also available from the Anritsu web site (www.anritsu.com).

With a valid GPS signal, the instrument will identify the current location on the displayed map with a cross. Saved locations are displayed with an orange square. Using one of the Anritsu recommended directional antennas, 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 4-6. Interference Mapping

Mapping Interference is a four-step process:

- Create a map using "Anritsu easyMap Tools" on page 4-11.
- Load the map and configure the "Instrument Settings" on page 4-11.
- Install a directional antenna on the instrument and track the interfering direction to "Locate the Interfering Signal" on page 4-14.
- "Save the Interference Information" on page 4-15.

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 4).

The maps are viewed on the Anritsu instrument during coverage mapping. Two Anritsu Map Files formats are available:

• legacy .map map files

The MAP files cannot be panned or zoomed, but they work with legacy firmware.

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

The AZM files provide the information that is required to pan and zoom maps on the spectrum analyzer instrument.

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

For best results, 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 Tools and capturing the map with GPS data.

Indoor Map

In easyMap Tools, open a 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 Anritsu easyMap Tools. Refer to "Anritsu easyMap Tools" on page 4-11.
- 2. Open up the Interference Analyzer by pressing the **Menu** key and selecting the Interference Analyzer icon or press **Shift** then **Mode** (9), highlight Interference Analysis and press **Enter**.
- **3.** Press the **Measurements** main menu key then press the **Interference Mapping** submenu key twice to display the Interference Mapping menu.
- 4. Turn on GPS.
 - a. Press Shift then System (8).
 - $\boldsymbol{b}.$ Press the GPS submenu key.
 - **c.** Connect a GPS antenna to the SMA connector.

- **d.** Turn on GPS. On should be underlined in the GPS submenu key.
- e. Press GPS info and verify that the information from three or more satellites is captured. Press **Esc** to close the info box.

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

Recall a Map

Note

The instrument allows you to recall a .map 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.

Connect the USB flash drive that has the map file or files created in "Anritsu easyMap Tools" on page 4-11 to the instrument.

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

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

1. Press the Refresh Directories key.

- 2. If the drive is still not visible, remove and then reconnect the USB flash drive.
- 3. Reformat the USB flash drive and copy the map files to the reformatted drive.

Recall the Default Grid

With a valid GPS signal, the instrument is able to make interference mapping measurements even when an Anritsu easyMap Tools file of the current location is not available. Location, signal strength, and bearing information will be saved in a (.kml) file. Details of each time the Save Current Point Location & Direction submenu key was pressed can be viewed at a later time on the instrument or in Google Earth. Refer to "Mapping Save/Recall Menu" on page 4-43 for additional information on recalling saved maps and .kml data.

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

- 1. Press the IA Mapping main menu key at the bottom of the screen.
- 2. Press the Save/Recall Points/Map submenu key.
- $\mathbf{3.}\ \mathrm{Press}\ \mathrm{the}\ \mathrm{Recall}\ \mathrm{Default}\ \mathrm{Grid}\ \mathrm{submenu}\ \mathrm{key}.$



Figure 4-7. Locating an Interfering Signal with the Default Grid

Locate the Interfering Signal

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

- 1. Press the **Measurements** main menu key then the Spectrum submenu key.
- 2. Press the **Freq** main menu key and enter the frequency of the interfering signal using the **Center Freq** submenu key.
- 3. Connect the directional antenna to the RF In port.
- 4. Press the **Measurements** main menu key then the Interference Mapping submenu key.
- **5.** Press the Interference Mapping submenu key again to open the Interference Mapping menu. Use the directional antenna to locate the bearing of the strongest signal. Rotate the knob until the red line on the display is aligned with the direction of the interfering signal. Press the Save Current Point Location & Direction submenu key to save the location and direction.
- **6.** Move to the next location and repeat Step 5. You now have two lines on the screen and an idea of where the interfering signal is located.
- 7. An arrow is shown when your current location is outside the map (Figure 4-8).



Figure 4-8. Arrow Indicating Current Location is Off the Map

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

Save the Interference Information

There are three save options in Interference Mapping: "Save KML Points", "Save Tab Delimited Points" on page 4-16 or "Save JPG" on page 4-16.

Save KML Points

Press Save/Recall Points/Map then Save KML Points. Enter a file name at the Save menu and press **Enter**. The following information is saved at the default location for the points and vectors currently displayed on the screen:

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

The .kml file can be opened and viewed with Google Earth (http://earth.google.com/) and also recalled and viewed on the Instrument. Refer to "Mapping Save/Recall Menu" on page 4-43 for additional information.



Figure 4-9. Interference Mapping KML File in Google Earth

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

Installing Google Earth

1. Go to the web site: http://earth.google.com/.

2. Click Download Google Earth and follow the on-screen instructions.

3. After download, install Google Earth on your computer.

Note 4. Double-click on the saved .kml file to view the measurements Google Earth.

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

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

Save Tab Delimited Points

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

Save JPG

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



Figure 4-10. Interference Mapping Saved as a .jpg File

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

4-9 Interference Analyzer (IA) Menus

Figure 4-11 though Figure 4-17 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 on the following pages).



Figure 4-11. Main Menu Keys



Figure 4-12. Measurements Menu Keys (1 of 2)



Figure 4-13. Measurements Menu Keys (2 of 2)



Figure 4-14. Sweep Submenu Keys



Figure 4-15. Trace Submenu Keys



Figure 4-16. Limit Submenu Keys



Figure 4-17. System Menu, Application Options Submenu Keys

4-10 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 affect as the MHz submenu key.

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

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

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

Span: Press the **Freq** main menu key followed by the Span submenu key and enter the desired span. The Span menu is used to set the frequency range over which the instrument will sweep. The span can be set from 10 Hz to the maximum frequency range the product will support. See the product specifications for the maximum frequency. Span can also be set to zero span.

The submenu key shows the current value for span in units of GHz, MHz, kHz, or Hz. When the Span button is pressed, span becomes the active parameter and may be changed. Use the keypad, the directional arrow keys, or the rotary knob to increase or decrease the span frequency. If the span is changed using the arrow keys, the span changes in a 1-2-5 sequence of the Frequency Step for each key press. See "Span Menu" on page 4-26.

Figure 4-18. IA Frequency Menu (1 of 2)

Freq (Frequency) Menu (Continued)





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
Span	of GHz, MHz, kHz, or Hz. When the Span button is pressed, span becomes
Span	the active parameter and may be changed. Use the keypad, the directional
1.000 MHz	If the span is changed by using the up and down arrow keys, the span
Span Up	Menu" on page 4-24.
1-2-5	Span Up 1-2-5: This is a convenient way to quickly arrive at a wider span
Span Down	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
1-2-5	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.
Full Span	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
Zero Span	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.
Last Span	Full Span: Pressing this button sets the span to cover the entire tunable spectrum of the unit.
Back	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 4-20. IA Span Menu
4-11 Amplitude Menu

Key Sequence: Amplitude



Reference Level: The reference level is the top graticule line on the display, and valid reference levels can be set from +30 dBm to -130 dBm. A value may be entered from the key pad, using the \pm key as the minus sign. After entering the value press the dBm submenu key or the **Enter** key. The **Up/Down** arrow keys change the reference level in 10 dB steps, and the **Left/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 LvI: Press this submenu key and use the keypad, the rotary knob or the arrow keys to change the attenuation value.

RL Offset On/Off: Reference Level Offset compensates for the presence of an external input attenuation or gain. Enter a positive value to compensate for an external amplifier or a negative value to compensate for an external attenuator. Use the ± key to enter the negative sign when a negative attenuation value is being entered.

Units: Select the display units from this submenu key:

dBm, dBV, dBmV, dBµV, Volt, A, or Watt, and in field strength measurements: dBm/m², dBv/m, dBmV/m, dBµV/m, Volt/m, Watt/m², dBW/m², A/m, dBA/m, Watt/cm²

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 4-28.

Figure 4-21. IA Amplitude Menu

Detection Menu

Key Sequence: **Amplitude** > Detection



Figure 4-22. IA Detection Menu

4-12 BW (Bandwidth) Menu

Key Sequence: ${\boldsymbol{\mathsf{BW}}}$

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
RBW	rotary knob. The range is 10 Hz to 3 MHz in a 1-3 sequence, from 10 Hz to 30 Hz to 100 Hz, and so on.
3 MHz	Note: Confirm Quasi-peak is not activated in the Detection menu before
Auto RBW	Setting RDW.
On Off	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
VBW	to RBW can be specified using the Span/RBW submenu key.
1 MHz	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
Auto VBW	knob. The range is 1 Hz to 3 MHz in a 1-3 sequence.
<u>On</u> Off	Auto VBW On/Off: When Auto VBW is On, the instrument selects the video
RBW/VBW	resolution bandwidth can be set using the RBW/VBW submenu key.
3	RBW/VBW: This submenu key displays the ratio between resolution
Span/RBW	and use the keypad, the arrow keys, or the rotary knob to select a new ratio.
300	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 300, meaning that the span width is approximately 300 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 4-23. IA Bandwidth Menu

4-13 Measurements Menu

Key Sequence: Measurements

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



Figure 4-24. IA Measurement Menu

Spectrum Menu

Key Sequence: Measurements > Spectrum

Spectrum	
Field	
	gain characteristics and measures the field strength over the frequency range of the antenna in units of dBm/meter ² , dbV/meter, dBmV/meter, dBµV/meter, volts/meter or watts/meter ² . Opens the "Field Strength Menu" on page 4-32.
	OCC BW: Opens the "OCC BW Menu" on page 4-32. Select either % or dBc method of occupied bandwidth measurement.
	Channel Power: Activates the Channel Power measurement function. Channel Power and Channel Power Density are measured based on the selection in the Units menu. Opens the "Channel Power Menu" on page 4-33.
ACPR \rightarrow	ACPR: Accesses a menu of Adjacent Channel Power Ratio measurement options. See the "ACPR Menu" on page 4-34.
AM/FM Demod →	AM/FM Demod: The user can select AM, Narrow Band FM (300 μs de-emphasis), Wide Band FM (50 μs de-emphasis), Upper Sideband or Lower Sideband. See the "AM/FM Demod Menu" on page 4-35.
C/I →	C/I: The Carrier to Interference ratio is a two-step measurement sequence that first measures the amplitude of a carrier, then, with the carrier turned off, measures the amplitude of all other interfering signals within the channel bandwidth. See the "C/I Menu" on page 4-36.
Measurement Off	Measurement Off: Turns the measurement off.
\vdash	More: Opens the "Measure 2/2 Menu" on page 4-37.
More \rightarrow	

Figure 4-25. IA Spectrum Menu

Field Strength Menu

Key Sequence: Measurements > Spectrum > Field Strength

F Strength	
On	On/Off: Turns field strength measurements on or off.
Off	Antenna: This submenu key brings up a dialog box that lists all the antennas
Antenna	for which the instrument has data, including both standard antennas and custom antennas that have been added using Master Software Tools. Use the Up/Down arrow keys or the rotary knob to select the desired antenna and press Enter .
	Back: Returns to the "Spectrum Menu" on page 4-31.
Back	

Figure 4-26. IA Field Strength Menu

OCC BW Menu

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

OCC BW	
On	On/Off: This submenu key turns the Occupied Bandwidth on or off.
Method	Method: Select either the % of Power (default) or dB Down measurement method as displayed in the message area.
<u>% Int Pwr</u> > dBc	% Int Pwr: Use the keypad, the directional arrow keys, or the rotary knob to enter the percent of power, from 0 % to 99 %.
% 99.00 %	> dBc: Use the keypad, the directional arrow keys, or the rotary knob to enter the dBc value (0 dBc to 100 dBc).
dBc	Back: Returns to the "Spectrum Menu" on page 4-31.
3	



Channel Power Menu

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

Channel Pwr On <u>Off</u> Center Freq	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.
1.939 900 GHz Ch Pwr Width 24.960 MHz Span	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/Down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu". The Left/Right arrows change the frequency by 10 % of the span.
24.960 MHz	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/Down arrow keys change the Channel Power Width by the frequency step value. The Left/Right arrow keys change the value by 10 % of the span.
Back	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 "Spectrum Menu" on page 4-31.



ACPR Menu

Key Sequence: Measurements > Spectrum > ACPR

ACPR	On/Off: Begins or ends the ACPR measurement.
On Off	Main Ch BW: Sets the bandwidth of the main channel for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob
Main Ch BW	to enter a specific frequency. When using the keypad, press the GHz, MHz, kHz, or Hz submenu key to accept the frequency input.
8.320 MHz	Changing this value automatically changes the adjacent channel bandwidth and channel spacing.
Adj Ch BW	Adj Ch BW: Sets the bandwidth of the adjacent channels for ACPR
8.320 MHz	measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter a specific frequency. When using the keypad, press
Ch Spacing	the GHz, MHz, kHz, or Hz submenu key to accept the frequency input.
8.320 MHz	Ch Spacing: Sets the channel spacing between the main and adjacent channels. Use the keypad, the directional arrow keys, or the rotary knoh to
Span	enter a specific frequency. When using the keypad, press
24.960 MHz	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/Down arrows change the frequency by the frequency step size entered in the "Freq (Frequency) Menu". The Left/Right arrow keys change the value by 10 % of the span.
Back	Span: Sets the span for ACPR measurement. Use the keypad, the directional arrow keys, or the rotary knob to enter the span.
\leftarrow	Back: Returns to the "Spectrum Menu" on page 4-31.

Figure 4-29. IA ACPR Menu

AM/FM Demod Menu

Key Sequence: Measurements > Spectrum > AM/FM Demod





C/I Menu

Key Sequence: Measurements > Spectrum > C/I



Figure 4-31. IA C/I Menu

Measure 2/2 Menu

Key Sequence: Measurements > Spectrum > More



Figure 4-32. IA Measure 2/2 Menu

Spectrogram Menu

Key Sequence: Measurements > Spectrogram

Spectrogram Sweep Interval Auto	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	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
Auto	minute and 4320 minutes (72 hours). When the time span is reached, the
Record	runs continuously. Entering a time span value causes the corresponding
On Off	sweep interval value to be automatically computed and shown when the Sweep Interval submenu key is pressed.
Time Cursor 0	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.
Reset+ Restart Measurement	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/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 : Resets or Restarts the measurement.
Back ←	Back: Returns to the "Measurements Menu" on page 4-30.

Figure 4-33. IA Spectrogram Menu

Signal Strength Menu

Key Sequence: Measurements > Signal Strength



Figure 4-34. IA Signal Strength Menu

RSSI Menu

Key Sequence: Measurements > RSSI



Figure 4-35. IA RSSI Menu

Signal ID Menu

Key Sequence: **Measurements >** Signal ID

Signal ID	
Scan Type	Scan Type
All Freq	All Freq: The Signal ID feature in the Interference Analyzer can help to quickly identify types of the interfering signals.
Scan Freq	All: Identifies all frequencies within the designated span.
3.550 GHz Continous	Freq: Displays the signal data for the selected scan frequency in the Signal ID Results window.
Monitoring	Scan Freq: Press this submenu key to enter manually a desired center frequency for monitoring.
Single O Sweep and Review	Continuous Monitoring: Press this submenu key to continuously sweep across the start and stop frequencies, entered frequency span, or scan frequency.
Trigger Sweep	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 4-30.
Back ←	

Figure 4-36. IA Signal ID Menu

Interference Mapping Menu

Key Sequence: Measurements > Interference Mapping

Interference Mapping Save Current Point Location & Direction Save/Recall Points/Map Delete Last Saved Point Delete ALL Points/Map Delete Last Saved Point Delete ALL Points Speaker On Orff Volume Reset Max/Min Hold Back		
Save Current Point Save Current Point Location & Direction: Pressing this button saves the location and direction of the current point and direction setup on the screen. The direction is indicated by the dark red line. This can be rotated around the current location with the rotary knob. Save/Recall Save/Recall Uncert Point Location & Direction: Opens the "Mapping Save/Recall Menu" on page 4-43. Delete Last Save/Recall Points Delete Clast Saved Point: This deletes the last saved point and direction from the screen. Delete ALL Points Speaker On Off Volume Adjust the volume when the Speaker submenu key is On. 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 Back: Returns to the "Measurements Menu" on page 4-30.	Interference Mapping	
Location & Direction Save/Recall Points/Map Delete Last Saved Point Delete Last Saved Point Delete Last Saved Point Delete Last Saved Point Delete ALL Points Speaker On Off Volume Reset Max/Min Hold Back	Save Current Point	Save Current Point Location & Direction: Pressing this button saves the
Save/Recall Points/Map Delete Last Last Saved Point Delete Last Last Delete ALL Points Delete Delete ALL Points Delete Delete ALL Points Delete Delete ALL Points Con Off Volume On Notice Reset Max/Min Hold Back Back	Location & Direction	location and direction of the current point and direction setup on the screen.
Points/Map Save Current Point Location & Direction: Opens the "Mapping Save/Recall Menu" on page 4-43. Delete Last Saved Point Delete Last Saved Point: This deletes the last saved point and direction from the screen. Delete ALL Points Delete All Points: Clears the screen of all the points and directions currently displayed. 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. 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 Back: Returns to the "Measurements Menu" on page 4-30.	Save/Recall	current location with the rotary knob.
Delete Last Saved Point Delete Last Saved Point: This deletes the last saved point and direction from the screen. Delete All Points: Clears the screen of all the points and directions currently displayed. Speaker On Off On Off Off Volume Adjust the volume when the Speaker submenu key is On. 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 Back: Returns to the "Measurements Menu" on page 4-30.	$\stackrel{\text{Points/Map}}{\longrightarrow}$	Save Current Point Location & Direction: Opens the "Mapping
Last Saved Point Delete ALL Points Speaker On Off Volume Reset Max/Min Hold Back	Delete	Save/Recall Menu On page 4-43.
Saved Point From the screen. Delete ALL Points Speaker On Off Volume Adjust the volume when the Speaker submenu key is On. Reset Max/Min Hold Back	Last	Delete Last Saved Point: This deletes the last saved point and direction
Delete All Points: Clears the screen of all the points and directions currently displayed. 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. 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 Back: Returns to the "Measurements Menu" on page 4-30.	Saved Point	from the screen.
ALL Points Speaker On Off Off Volume Adjust the volume when the Speaker submenu key is On. Reset Max/Min Hold Back		Delete All Points: Clears the screen of all the points and directions currently
ALL Points 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. 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 4-30.	Delete	dienleved
Points Speaker On Off On Off Volume Adjust the volume when the Speaker submenu key is On. Reset Max/Min Hold Back: Back Back:	ALL	displayed.
Speaker On Off: Sounds a tone based on received signal strength. Off mutes the speaker. Volume Volume: Adjust the volume when the Speaker submenu key is On. 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 Back: Returns to the "Measurements Menu" on page 4-30.	Points	Speaker
On Off Volume Volume: Adjust the volume when the Speaker submenu key is On. Reset Max/Min Hold Back: Returns to the "Measurements Menu" on page 4-30.	Speaker	On Off: Sounds a tone based on received signal strength. Off mutes the
On Off Volume Volume: Adjust the volume when the Speaker submenu key is On. 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 Back: Returns to the "Measurements Menu" on page 4-30.	Speaker	
Volume Volume Reset Max/Min Hold Back Keset Max/Min Hold Reset Max/Min Hold Reset Max/Min Hold Reset Max/Min Hold Reset Navion Nav	07 04	speaker.
Volume 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. Reset Max/Min Hold Back: Returns to the "Measurements Menu" on page 4-30.		Volume: Adjust the volume when the Speaker submenu key is On.
Reset Max/Min Hold Back ←	Volume	Reset Max/Min Hold: The lower and upper limit in the graph are adjusted
Reset Max/Min Hold Back: Back Back		and updated continuously to display the highest and lowest values. Press this
Back: Returns to the "Measurements Menu" on page 4-30.		button to reset the Max and Min values.
Back: Returns to the "Measurements Menu" on page 4-30.	Reset	
Hold Back	Max/Min	Back: Returns to the "Measurements Menu" on page 4-30.
Back	Hold	
Back		
Back		
\leftarrow	Back	



Mapping Save/Recall Menu

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



Figure 4-38. IA Interference Mapping Save/Recall Menu

4-14 Marker Menu

Key Sequence: Marker

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

Marker (1/2)	
Marker	Marker: Selects the active marker (1 to 6). The underlined marker number is the active marker.
<u> </u>	On/Off: Turns the selected marker underlined in the Marker key On or Off.
Off Delta	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.
On <u>Off</u>	Peak Search: This key places the currently active marker on the highest signal amplitude currently displayed on screen.
Peak Search	Marker Freq to Center: Moves the frequency noted by the active marker to the center frequency position and center of the display.
Marker Freq	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.
Center Marker to	More Peak Options: Brings up a secondary menu of submenu keys for more peak searching options. See the "More Peak Options Menu" on page 4-45.
Ref Lvl More Peak Options	More: Opens a submenu of additional Marker options. See the "Marker 2/2 Menu" on page 4-46.
More \rightarrow	

Figure 4-39. IA Marker (1/2) Menu

More Peak Options Menu

_

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

Marker & Peak	Peak Search: Places the currently active marker on the highest amplitude signal currently on screen.
Next Peak	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
Next Peak Right Delta Marker to	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.
Marker Freq to Center	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 to Ref Lvl	Marker Freq to Center: Sets the center frequency to the frequency of the currently active marker.
Peak Threshold	Marker to Ref LvI: Sets the reference level, top graticule line, to the amplitude of the currently active marker.
10.00%	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	Back: Returns to the "Marker Menu" on page 4-44.

Figure 4-40. IA Marker & Peak Menu

Marker 2/2 Menu

Key Sequence: Marker > More

Marker (2/2)				
Marker	Noise			
On	On <u>Off</u>			
Market	t Table			
On	Off			
All Ma	arkers			
О	ff			
Counter Marker				
On	Off			
Set Marker				
to Channel				
Marke	r Style			
Fixed	Tracking			
Marker 1 Reference				
On	Off			
Back				

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 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.

All Markers Off: Turns off all markers.

Counter Marker

On Off: Sets the frequency counter mode for all markers. 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 within the pixel 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

Fixed Tracking: This key changes the behavior of the reference markers. If Fixed is selected, reference markers stay at the amplitude they were at when the associated delta marker was turned on. If Tracking is selected, the amplitude of the reference marker changes as the signal amplitude is changed. Note that the reference marker tracks the amplitude, not the frequency of a signal.

Marker 1 Reference

On Off: 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 4-44.

Figure 4-41. IA Marker (2/2) Menu

4-15 Sweep Menu

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



Figure 4-42. IA Sweep Menu

Sweep Mode Menu

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

Sweep Mode	This menu sets the current sweep mode. Select one of the three Sweep Mode option.
C East	Fast: Fastest sweep speed.
	Performance: Provides best amplitude accuracy and ensures all specifications are met.
Performance	No FFT: Slowest sweep speed. Ideal for analog and pulse modulated signals.
O No FFT	Show Help: Display a table showing the merits and trade-offs of the three Sweep Mode settings.
	Back: Returns to the "Sweep Menu" on page 4-47.
Show Help	
Back	

Figure 4-43. IA Sweep Mode Menu

Trigger Menu

Key Sequence: Shift > Sweep (3) key > Trigger Type



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

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

Change Trigger Position: This submenu key is used in conjunction with video triggering to set the horizontal position on the display where a signal that meets the video triggering criterion will be placed. The value can be from 0 % to 100 %. Zero percent places the triggering event at the left edge of the screen while 100 % places the triggering at the right edge of the screen. When the trigger position is any value other than 0 %, the portion of the trace before the trigger event is displayed very quickly because the trace data is stored in memory. The portion of the trace after the trigger point is displayed on the screen at the normal rate as the signal is swept. This mode is used in Zero Span.

Manual Trigger: This submenu key can be used in zero span to immediately trigger a sweep when the trigger type is set to External or Video.

Back: Returns to the "Sweep Menu" on page 4-47.

Figure 4-44. IA Trigger Menu

Gate Setup Menu

.

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

Gate Setup	
Gated Sweep	Gated Sweep: Turns the Gated Sweep function On and Off.
On <u>Off</u>	Gate Source External: (Currently Not Used)
Gate Source	Gate Polarity Rising/Falling: Press to select the desired edge trigger to begin the gated sweep.
Gate Polarity	Gate Delay: Sets the start of the gated sweep indicated by the left blue line on the bottom graph.
Rising Falling	Gate Length: Sets the time of the gated sweep indicated by the right blue line on the bottom graph.
Gate Delay 0 us	Zero Span Time: Use this submenu key to set the time for the full length horizontal sweep of the time domain (bottom) graph.
Gate Length	Back: Returns to the "Sweep Menu" on page 4-47.
500 us	
Zero Span Time	
300 ms	
Back	
\leftarrow	

Figure 4-45. IA Gated Sweep Menu

4-16 Measure Menu

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

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

Pressing the **Measure** key opens the "Spectrum Menu" on page 4-31.

4-17 Trace Menu

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

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

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



Figure 4-46. IA Trace Menu

Trace A Ops Menu

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

Trace A Ops	
Normal -> A	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.
Max Hold -> A	Min Hold -> A: Shows the cumulative minimum value of each display point over many trace sweeps.
Min Hold -> A	Average -> A: Shows an exponential average of a number of traces, determined by the # of Averages key.
Average -> A	# 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 4-52.
# of Averages	
10	
Back	
	I

Figure 4-47. IA Trace A Ops Menu

Trace B Ops Menu

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

Trace B Ops	
A -> B	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.
B <-> C	Max Hold -> B: Shows the cumulative maximum value of each display point over many trace sweeps.
Max Hold -> B	Min Hold -> B: Shows the cumulative minimum value of each display point over many trace sweeps.
Min Hold -> B	Back: Returns to the "Trace Menu" on page 4-52.
Back	

Figure 4-48. IA Trace B Ops Menu

Trace C Ops Menu

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

Trace C Ops	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.
A-> C	Max Hold -> C: Shows the cumulative maximum value of each display point over many trace sweeps.
B <-> C	Min Hold -> C: Shows the cumulative minimum value of each display point over many trace sweeps.
Max Hold -> C	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.
Min Hold -> C	When trace math is active, a relative scale shows on the right side of the graph, and is associated to Trace C. This allows the user to optimize the display of Trace C without affecting the display of Traces A and B.
О А-В -> С	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
В-А->С	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	Relative Ref: Sets the value applied to the top graticule for the relative scale
10.0 dB	this value by using the rotary knob, Up/Down arrows, or entering the value on
Relative Scale	entry is valid only when trace math is active
10 dB/div	Relative Scale: Sets the value applied to the scaling of the relative scale that
	value by using the rotary knob, Up/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 4-52.

Figure 4-49. IA Trace C Ops Menu

4-18 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 4-50). Limit alarm failures are reported whenever a signal is above the upper limit line or below the lower limit line. By using save-on-event, a signal that causes a limit alarm can be automatically saved. See your User Guide for details.

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

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

Menu

Limit	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.
Limit	On/Off: This submenu key turns the active limit (upper or lower) on or off.
Upper Lower	Limit Edit: This submenu key displays the "Edit Menu" on page 4-58 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.
Off	Limit Move: Display the "Limit Move Menu" on page 4-60.
Limit Edit \rightarrow	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
Limit Move \longrightarrow	Figure 4-55 for an example limit envelope. Press this submenu key to open the "Limit Envelope Menu" on page 4-61.
Limit Envelope →	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
Limit Advanced \rightarrow	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
Limit Alarm	Menu" on page 4-63.
On <u>Off</u>	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
Set Default Limit	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 lim 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 4-50. IA Limit Menu

Edit Menu

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

Edit
Frequency
1.964 718 182 GHz
Amplitude
-75.0 dBm
Add
Point
Add
Vertical
Delete
Point
Next
Point
Left
Next
Point
Right
Back \leftarrow

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/Right** arrow keys, or the rotary knob to change the frequency of an inflection point. The **Left/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 \pm key to set a negative value), the **Up/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/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 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 4-51. IA Limit Edit Menu (1 of 2)
```

Edit Menu (continued)

Edit	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.
Frequency	The two inflection points share the same frequency and are centered midpoint between adjacent measured points. The magnitudes of the points
1.964 718 182 GHz	are set by using a visually intuitive algorithm that is based upon the adjacent
Amplitude	inflection points.
-75.0 dBm	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
Add	frequency, a limit inflection point will keep that exact frequency and place the limit point appropriately regardless of the frequency span. This is especially
Point	useful for emission mask verification.
Add	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
Vertical	that was deleted.
Delete	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
Point	active for editing or deletion. With each key press, the active point becomes
Next Point	active point becomes the left-most point on the screen.
Left	Next Point Right: Press this submenu key to select the limit point
Next Point Right	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
\vdash	active point becomes the right-most point on the screen.
Back	Back: Press this submenu key to return to the "Limit Menu" on page 4-56.



 \leftarrow

Limit Move Menu

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

	Move Limit to Current Center Freq: Pressing this submenu key moves the
Limit Move	center of the existing limit line to the center frequency of the measurement.
Move Limit	The span of the existing limit line is not changed by doing this. Use this
to Current	submenu key as an easy way to get an existing limit line on screen. If no limit
Center Freq	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
Move Limit	from the bottom of the screen for the lower limit line.
0.0 dB	Move Limit ## dB: If the limit line is flat, then use this submenu key to move
Move Limit	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
0 Hz	number of dB. Use the keyboard to enter the desired value. The entire line
Move Limit	using the rotary knob. Turn the rotary knob clockwise to move the line to
to Marker 1	higher power levels. The Up/Down arrows move the limit line by 5 % of the screen height. The Left/Right arrows move the limit line by 0.2 % of the
Offset from Marker 1	screen height or 0.2 dB when the scale is set to 10 dB/division.
10.0 dB	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/Right arrows move the limit line by 5 % of the span while the Up/Down arrows move the line by one display pixel.
Back	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 1submenu 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 4-56.

Figure 4-53. IA Limit Move Menu

Limit Envelope Menu

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



Back: Press this submenu key to return to the "Limit Menu" on page 4-56.

Figure 4-54. IA Limit Envelope Menu



Figure 4-55. Square Limit Envelope



Figure 4-56. 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 4-56.



4-19 Application Options

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

Options Impedance	
50 Ohm 75 Ohm Other	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
Bias Tee	Anritsu 12N50-75B adapter. For other adapters, select Other and enter the appropriate loss.
	Bias Tee: Opens the Bias Tee submenu.
	Bias Tee On Off: Toggles On and Off the variable power supply.
Back	Bias Tee Voltage: Use this submenu to set the power supply voltage. The current Bias Tee voltage selection is shown in red near the top of the graticule.
	Current
Bias Tee	Back: Press this submenu key to return to the Ontions Menu
Bias Tee	Back . Press this submenu key to return to the previous menu.
On <u>Off</u>	
Bias Tee Voltage	
15.0 V	
Current	
Back	
\leftarrow	

Figure 4-58. IA Application Options

4-20 Other Menus

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

Chapter 5 — Channel Scanner (Option 27)

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 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.

5-2 General Measurement Setups

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

5-3 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.

Note Measurements can be made when the base station is in service, out of service, or over the air.

5-4 Custom Setup Measurements

Procedure

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

5-5 Custom Setup Example

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

The signals on or near the rooftop are:

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

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

After the channels are set up, press Shift | File | Save | Save Setup | and name the setup for easy recall later.

5-6 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 second set of channels for 3 iterations and continues on till the fifth set is tested for 3 iterations. Then the list of 100 channels is tested again with each set of channels being tested 3 times. Testing is ended when five cycles of testing on 100 channels are 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 override these parameters, follow Step 4 through Step 6, otherwise continue to Step 7.

- **4.** Press the Repeat Scan Type to select the desired scan mode **#** Scans, go to Step a, to select Time, or go to Step b to set the testing period.
 - **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.

5-7 Channel Scanner (CHS) Menu Tree

Figure 5-1 show the map of the Channel Scanner menus. The following sections describe CHS 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 on the following pages).



Figure 5-1. Main Menu Keys

5-8 Scanner Menu

Key Sequence: Scanner

Scanner	Scan Channels: Opens the "Channel Scan Menu" on page 5-8.
Scan 🔴	Scan Frequencies: Opens the "Freq Scan Menu" on page 5-9.
Channels → Scan O	Scan Custom List Frequencies: Opens the "Custom Scan Menu" on page 5-12.
Frequencies Scan O	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.
Custom List Scan O Script Master	If a script file has been selected or in use, then the "Scan Script Master Menu" on page 5-10 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 5-2. CHS Scanner Menu

Channel Scan Menu

Key Sequence: Scanner > Scan Channels

Channel Scan	
Signal Standard	Signal Standard: Opens the Signal Standards list dialog to select a signal standard.
Channel	Channel: Opens the Channel Editor list to set a valid band in the selected signal standard.
50 Number of Channels	Number of Channels: Sets the number of channels to be displayed. From 1 to 20 channels can be displayed.
20	Channel Step Size: Sets the number of channels to skip between displayed channels.
Channel Step Size	Back: Returns to the "Scanner Menu" on page 5-7.
1	
Back	

Figure 5-3. CHS Channel Scan Menu

Freq Scan Menu

Key Sequence: Scanner > Scan Frequencies

Freq Scan	
Start Freq	Start Freq: Sets the center frequency of the first channel to be displayed.
580.000 kHz	Freq Step Size: Sets the spacing between frequencies on the display.
Freq Step Size	Bandwidth: The channel bandwidth can be manually entered in GHz, MHz, kHz, or Hz.
Bandwidth	Number of Channels: Sets the number of channels to be displayed (1 to 20).
9.000 kHz	Back: Returns to the "Scanner Menu" on page 5-7.
Number of Channels	
20	
Back	

Figure 5-4. CHS Frequency Scan Menu

Scan Script Master Menu

Key Sequence: Scanner > Scan Script Master

Scan Script Master	
Select Test	Select Test: Opens the Select Script Master Scan Setup File dialog to select a script file for measurement use.
Repeat Scan Type	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)	# of Repeats (List): Sets the number of scan repetitions for the # of Repeats (Set).
1000 Scan Duration	Scan Duration: Sets the period of time channel scanning takes place for use with Repeat Scan Type.
00:11:00	# of Repeats (Set): Sets the number of times each set of 20 channels are scanned.
# of Repeats (Set)	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.
Record	Start/Restart Test: Starts or Restarts the test.
On Off	Back: Returns to the "Scanner Menu" on page 5-7.
Start/Restart Test	
Back	

Figure 5-5. CHS Scan Script Master Menu

5-9 Amplitude Menu

Key Sequence: Amplitude

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

Figure 5-6. CHS Amplitude Menu

5-10 Custom Scan Menu

Key Sequence: Custom Scan



Figure 5-7. CHS Custom Scan Menu

5-11 Measurements Menu

Key Sequence: Measurements

Measurements	Display
Display	Graph Table: Toggles the display between table and graph formats, see
Graph Table	Figure 5-9 and Figure 5-10 for examples of the two formats.
Max Hold On 5 sec Off Channel Unit	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.
<u>Channel</u> Freq	Channel Unit Channel Freq: Toggles the display channel units between channel number and frequency.
Units Display	Units Display
Current Max	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 to 5 sec).
Color Code	Color Code
Single Dual	Single Dual: Channels can be represented in one color or two alternating colors.

Figure 5-8. CHS Measurements Menu

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



Figure 5-9. Channel Scanner Graph Display

Anritsu 12/10/2008 08:03:44 pm							Measurements			
D (1)						Frequency Scanne Text Viev		Display		
-65.0 dBm	Fre	equency	Power	(dBm)	Frequency		Power (dBn	n)	Graph <u>Ta</u>	
Scale 10 dB/div	869.	010 MHz	-11	3.7	869.310 N	ИНz	-108.5		Max Hold	
Start Freq 869.010 MHz	869.	040 MHz	-11	2.7	869.340 N	ИНz	-115.6	Channel Unit		I Units
Span 30.000 kHz	869.	070 MHz	-11	6.6	869.370 N	ИНz	-117.9	Channel		<u>Freq</u>
Freq Step	869.	100 MHz	-11	5.5	869.400 N	∕IHz	-115.0			
Reference Freq	869.	130 MHz	-11	2.8	869.430 N	ИНz	-119.7		Units D	splay
Power Display	869.	160 MHz	-11	4.4	869.460 N	∕lHz	-119.0	<u> </u>	<u>Current</u>	Max
Current	869.	190 MHz	-11	4.0	869.490 N	ИНz	-113.5		Single	<u>Dual</u>
Off	869.	220 MHz	-11	8.0	869.520 N	ИНz	-117.0			
	869.250 MHz		-11	4.4	869.550 N	ИНz	-114.2			
869.280 MHz – 1		-11	5.5	869.580 N	ИНz	-117.4				
Scanner Ampli		Amplitu	ıde	Cust	om Setup	N	leasurements			

Figure 5-10. Channel Scanner Table Display

5-12 Sweep Menu

This menu is not available in Channel Scanner measurement mode.

5-13 Measure Menu

This menu is not available in Channel Scanner measurement mode.

5-14 Trace Menu

This menu is not available in Channel Scanner measurement mode.

5-15 Limit Menu

This menu is not available in Channel Scanner measurement mode.

5-16 Other Menus

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

Chapter 6 — CW Signal Generator (Option 28)

Note The information in this chapter applies to the instruments with Option 28, CW Generator. Users of the LMR Master S412E should refer to Chapter 3.

6-1 Introduction

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

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

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

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

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

Required Equipment

- Site Master S332E/S362E or Spectrum Master MS2712E/MS2713E or Cell Master MT8212E
- CW Signal Generator Kit 69793

6-2 Procedure

- 1. On the instrument, press the Menu key and select the CW Signal Generator icon.
- **2.** Connect the attenuator to the RF Out port and the splitter to the RF In port as show in Figure 6-1.



Figure 6-1. CW Signal Generator Configuration

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



Figure 6-2. 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 6-3. 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 7 — Coverage Mapping (Option 431)

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

7-1 Introduction

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

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

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

7-2 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.

7-3 Spectrum Analysis Settings

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

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

7-4 Coverage Mapping

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

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

- **Indoor Mapping:** Using a start-walk-stop approach, the instrument provides in-building coverage mapping by overlaying data directly onto the downloaded map. Data is captured at user-defined time intervals or user-defined map locations.
- **Output Mapping:** The instrument logs data automatically based on either time or distance interval. If there is no map available when making the measurements, it is still possible to save all the data to a KML file and then later combine the data file with a map.

Outdoor Coverage

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



Figure 7-1. Outdoor Coverage Mapping (GPS On)

Indoor Coverage

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



Figure 7-2. Indoor Coverage Mapping (GPS Off)

Coverage Mapping is a four-step process:

- Create an indoor or outdoor map using "Anritsu easyMap Tools" on page 7-3.
- Load the map and configure the "Instrument Settings" on page 7-5.
- Install an antenna on the instrument and "Map the Signal Strength" on page 7-7.
- "Save the Coverage Mapping Information" on page 7-8.

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 4).

The maps are viewed on the Anritsu instrument during coverage mapping. Two Anritsu Map Files formats are available:

• legacy .map map files

The MAP files cannot be panned or zoomed, but they work with legacy firmware.

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

The AZM files provide the information that is required to pan and zoom maps on the spectrum analyzer instrument.

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

For best results, 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 a 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 Anritsu easyMap Tools. Refer to "Anritsu easyMap Tools" on page 7-3. Outdoor mapping requires a GeoEmbedded map or the default grid.
- 2. Open up Coverage Mapping by pressing the **Menu** key and selecting the **Spectrum** Analyzer icon or press **Shift** then **Mode** (9), highlight Spectrum Analyzer and press **Enter**.
- **3.** Press **Shift** then **Measure** (**4**). Press the More submenu key then press the Coverage Mapping submenu key. Confirm that coverage mapping is On.

Continue 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.
 - e. Press GPS info and verify that the information from three or more satellites is captured. Press **Esc** to close the info box.

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

Recall a Map (Indoor or Outdoor Coverage)

The instrument allows you to recall a .map file (created with Anritsu 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 the user positions the cross at the current location using the touchscreen, or by using the arrow keys and then **Enter**.

Connect the USB flash drive that has the map file or files created in "Anritsu easyMap Tools" to the instrument.

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

Step 5 and 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 cross with outdoor mapping.
- **6.** If the current location is outside the map boundaries, an arrow will indicate the direction of the current location in relation to the displayed map.

	If you do not see the USB drive in the Recall menu:
Note	 Press the Refresh Directories key. If the drive is still not visible, remove and then reconnect the USB flash drive. 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 7-21 for additional information on recalling saved maps and .kml data.

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

- 1. Select the Coverage Mapping submenu key.
- 2. Press the Save/Recall Points/Map submenu key.
- $\mathbf{3.}\ \mathrm{Press}\ \mathrm{the}\ \mathrm{Recall}\ \mathrm{Default}\ \mathrm{Grid}\ \mathrm{submenu}\ \mathrm{key}.$



Figure 7-3. Coverage Mapping with the Default Grid. Same .kml data as Figure 7-2

Map the Signal Strength

Coverage Mapping supports RSSI measurement or ACPR measurement during mapping.

ACPR

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

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

- 4. Press the Start Data Collection main menu key. Data will be collected at the time or distance interval based on the setting in "Point Distance/Time Setup Menu" on page 7-19. The color of the squares indicate the power level based on the ACPR setup.
- 5. Press the Stop Data Collection main menu key. Save the collected data as a .kml file, a tab-delimited text file (.mtd), or a .jpg file. Refer to "Mapping Save/Recall Menu" on page 7-17.

Note The collected data can be saved in multiple formats.

RSSI

- 1. Select the Coverage Mapping submenu key.
- 2. Press the Measurement Setup submenu key.
- **3.** Press **RSSI** once to select and again to open the setup menu.
- 4. Set the threshold levels: Excellent, Very Good, Good, and Poor.
- **5.** Press the **Start Data Collection** main menu key. Data will be collected at the time or distance interval based on the setting in "Point Distance/Time Setup Menu" on page 7-19. The color of the squares indicates the power level based on the RSSI setup.
- 6. Press the Stop Data Collection main menu key. Save the collected data as a .kml file, a tab-delimited text file (.mtd), or a .jpg file. Refer to "Mapping Save/Recall Menu" on page 7-17.

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

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

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

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

Save the Coverage Mapping Information

There are three save options in Coverage Mapping: "Save KML Points", "Save Tab Delimited Points" on page 7-9 or "Save JPG" on page 7-10.

Save KML Points

Note

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

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

The .kml file can be opened and viewed with Google Earth (Figure 7-4 on page 7-9) and can also be recalled and viewed on the instrument. Refer to "Mapping Save/Recall Menu" on page 7-21 for additional information.

Installing Google Earth

Note	 Go to the web site: http://earth.google.com/. Click Download Google Earth and follow the on-screen instructions. After download, install Google Earth on your computer. Double-click on the saved .kml file to view the measurements Google Earth.
	After Google Earth is opened, user instructions and several types of help are available from the Help pull-down menu.
	Saved .kml files can not be viewed directly from the instrument using Google Earth, the files need to be first copied to a USB memory stick.



Figure 7-4. Coverage Mapping KML File in Google Earth

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

Save Tab Delimited Points

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

7-10

/Inritsu 04/26/2010 02:45:03 pm

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

County Par

N 37° 8' 48" W 121° 39' 22"

GPS

kml O Mapping Tab Delimited 101 Jpeg 101 Morgan Hil CONSIGN Change Terms of Us auency Quick Name 862.300 MHz RBW Lower ACPR Main Channel Pwr Upper ACPR Change 300 kHz 0.0 dB -94.2 dBm 0.0 dB Save Location Detection RMS/Avg Amplitude Span вw Start Data Collection Freq

Figure 7-5. Time Interval Coverage Mapping Saved as a .jpg File

Save

7-5 Coverage Mapping Menus

Figure 7-10 though Figure 7-15 show the map of the Spectrum Analyzer menus. Refer to Chapter 2, "Spectrum Analyzer" for the details of the menus and associated submenus.

Section 7-6 describes the details of Coverage Mapping (Option 431) menus and associated submenus. Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to menu descriptions on the following pages).



Figure 7-6. Main Menu Keys



Figure 7-7. Sweep Submenu Keys



Figure 7-8. Measure Submenu Keys







Figure 7-10. Limit Submenu Keys


Figure 7-11. System Menu, Application Options Submenu Keys

7-6 Coverage Mapping Menu

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



Figure 7-12. Coverage Mapping Menu

Mapping Save/Recall Menu

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

Mapping Save/Recall	
KML Points	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	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	Save JPG: Press the Save JPG key to save a .jpg file of the current screen.
JPG	Recall a Map: Opens the Recall menu for selecting a map created with the Anritsu easyMap Tools program to display on the screen.
Recall a Map	Recall KML Point: Opens the Recall menu for selecting a .kml file. Displays the saved locations overlaid on the default grid.
Recall KML Points Only Recall KML Points	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
With Map Recall Default Grid	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 7-20.
\leftarrow Back	



Measurement Setup Menu

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



Figure 7-14. Measurement Setup Menu

Point Distance/Time Setup Menu

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

Points Distance/Time	
Repeat Type <u>Time</u> Distance	Repeat Type: Toggles between using a Time or Distance interval for capturing data.
Repeat Time	Repeat Time: Sets the time interval when the Time is selected in the Repeat Type button.
00:00:10 Repeat Distance	Repeat Distance: Sets the distance interval when the Distance is selected in the Repeat Type button.
0.00 m	Distance Units: Toggles the unit of measure between meters and feet.
	Back: Returns to the "Coverage Mapping Menu" on page 7-20.
Distance Units	
<u> </u>	
Delete	
ALL Points	
Back	

Figure 7-15. Point Distance/Time Setup Menu

Refer to Chapter 2, "Spectrum Analyzer" for additional spectrum analyzer menus.

Chapter 8 — AM/FM/PM Analyzer (Option 509)

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

8-1 Introduction

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

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

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

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

Freq Amplitude Setup Measurements Marker

8-2 General Measurement Setup

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

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

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

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

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

If Demod Type is set to FM or PM, then the Set Carrier Freq to Center functionNote 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. Use either Step 4 or Step 5.
- 6. Press the Channel submenu key to open the Channel Editor list box and set a channel.
- 7. Press the Span submenu key to open the Span menu and to set a span value.
- **8.** Press the **Amplitude** main menu key to open the RF Amplitude menu. Here you may set the scale or the power offset.
- 9. Press the Measurements main menu key to open the Measurements menu.
- 10. From the Measurements menu, choose RF Spectrum, Audio Spectrum, Audio Waveform, or Summary.

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.

8-3 Example FM Demodulation Measurement

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

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

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

In this view, you can see the PL tone (or CTCSS tone) at the leading edge of the signal.

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

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.

8-4 AM/FM/PM Analyzer Menus

The AM/FM/PM Analyzer controls are accessed in the menus. The menus that are opened by the 5 main menu keys are shown Figure 8-1. Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to menu descriptions on the following pages).

Map of Main Menus



Figure 8-1. Main Menus with AM/FM/PM Analyzer (Option 0509)

Map of Frequency Menus



Figure 8-2. Frequency Menus with AM/FM/PM Analyzer (Option 0509)

Map of Measurements Menus



Figure 8-3. Measurements Menus with AM/FM/PM Analyzer (Option 0509)

Map of Audio Demod Menus



Figure 8-4. Audio Demod Menus with AM/FM/PM Analyzer (Option 0509)

8-5 RF Freq (Frequency) Menu

Key Sequence: Freq



8-6 RF Span Menu

Key Sequence: **Freq > Span**

RF Span	
Span ## Hz	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
Span Up	may also use the rotary knob or the arrow keys, then press the Enter key.
1-2-5	Span Up: Press to increase the Span. If starting at 10,000 kHz, the span increases to 20,000 kHz, 50,000 kHz, 100,000 kHz, 200,000 kHz
Span Down 1 – 2 – 5	500,000 kHz, 1000 MHz, 2000 MHz, and 5000 MHz. Each press of this submenu key increases the span to one of these listed values.
Max Span	Span Down: Press to decrease the Span. If starting at 5,000 MHz, then span decreases to 2000 MHz, 1000 MHz, 500,000 kHz, 200,000 kHz, 100,000 kHz, 50,000 kHz, 20,000 kHz, and 10,000 kHz. Each press of this submenu key decreases the span to one of these listed values.
Min Span	Max Span: Press to set the span to 5,000 MHz, the maximum value.
	Min Span: Press to set the span to 5,000 kHz, the minimum value.
	Last Span: Press to set the span to the previously set span value.
Last Span	Back: Press to return to the RF Freq menu.
Back	

Figure 8-6. RF Span Menu

8-7 (Signal) Standard List Menu

Key Sequence: **Freq** > Signal Standard

Standard List	
Display <u>All</u> Fav Select/Deselect	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.
Favorite	Select/Deselect Favorite: Press to mark (select) or unmark (deselect) signal standards in the Signal Standards list box.
Save Favorites	Save Favorites: Press to save any selections (or de-escalations) in the list.
Тор	Top of List: Press to move the list display to show the first (top of list) standards.
of List	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.
Page Up	Bottom of List: Press to move the list display to show the last (bottom of list) standards.
Page Down	
Bottom of List	

Figure 8-7. (Signal) Standard List Menu

8-8 Amplitude Menu

Key Sequence: Amplitude

RF #	F Amplitude Scale ## dB/div	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.
Pc	ower Offset	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	Adjust Range: Press to change the reference level if the signal strength is too high (ADC error) or too low.

Figure 8-8. Amplitude Menu

8-9 Setup Menu

Key Sequence: Setup

[Setup	Demod Type
ĺ	Demod Type AM FM PM	options. The selection toggles through the three choices, and the current setting is underlined on the submenu key.
	IFBW ## Hz	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 <u>On</u> Off	Auto IFBW Off On: 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.

Figure 8-9. Setup Menu

8-10 Measurements Menu

Key Sequence: Measurements

```
or Shift > Measure (4) key
```

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

Measurements	
RF Spectrum	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	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.
Summary	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.
Audio Demod	Audio Demod: Press to open the Auto Demod menu.
\rightarrow	Save Measurement: Opens the Save menu
Save Measurement	

Figure 8-10. Measurements Menu

RF Spectrum Menu 8-11

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.

Key Sequence: Measurements > RF Spectrum > RF Spectrum (press same button twice)

or Shift > Measure (4) key > RF Spectrum > RF Spectrum

Figure 8-11. RF Spectrum Menu

8-12 Audio Spectrum AM Menu

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.

Key Sequence: Measure > Audio Spectrum > Audio Spectrum (press same button twice)

or Shift > Measure (4) key > Audio Spectrum > Audio Spectrum

Figure 8-12. Audio Spectrum AM Menu

8-13 Audio Waveform AM Menu

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.

Key Sequence: Measure > Audio Waveform > Audio Waveform (press same button twice)

or Shift > Measure (4) key > Audio Waveform > Audio Waveform

Figure 8-13. Audio Waveform AM Menu

8-14 Audio Spectrum FM Menu

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.

Key Sequence: Measure > Audio Spectrum > Audio Spectrum (press same button twice)

or Shift > Measure (4) key > Audio Spectrum > Audio Spectrum

Figure 8-14. Audio Spectrum FM Menu

8-15 Audio Waveform FM Menu

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.

Key Sequence: Measure > Audio Waveform > Audio Waveform (press same button twice)

or Shift > Measure (4) key > Audio Waveform > Audio Waveform

Figure 8-15. Audio Waveform FM Menu

8-16 Audio Spectrum PM Menu

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.

Key Sequence: Measure > Audio Spectrum > Audio Spectrum (press same button twice)

or Shift > Measure (4) key > Audio Spectrum > Audio Spectrum

Figure 8-16. Audio Spectrum PM Menu

8-17 Audio Waveform PM Menu

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.

Key Sequence: Measurements > Audio Waveform > Audio Waveform (press same button twice)

or Shift > Measure (4) key > Audio Waveform > Audio Waveform

Figure 8-17. Audio Waveform PM Menu

8-18 Audio Demod AM Menu

Key Sequence: Measure > Audio Demod

or Shift > Measure (4) key > Audio Demod

Figure 8-18. Auto Demod AM Menu

8-19 Audio Demod FM Menu

Key Sequence: **Measure** > Audio Demod

or Shift > Measure (4) key > Audio Demod

8-20 Marker Menu

Key Sequence: Marker

Marker	Marker 1 2 3 4 5 6: Press to turn On a specific marker. Each press of the submenu key toggles to the next marker number. The active (selected) marker is underlined on the submenu key
<u>1 2 3 4 5 6</u>	On Off: Press to turn On and Off the selected marker. The current setting is underlined on the submenu key.
On Off Delta	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	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.
Center	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.
to Ref Lvl	Marker Table On Off: Press to turn On or Off the marker table, which is displayed below the sweep window. The table is automatically sized to display all markers that
Marker Table On <u>Off</u>	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
All Markers Off	key. All Markers Off: Press to turn Off all markers.

Figure 8-20. Marker Menu

Appendix A — Error Messages

A-1 Introduction

This chapter provides a list of information and error messages that could be displayed on your instrument. If any error condition persists, contact your local Anritsu Service Center (http://www.anritsu.com/Contact.asp).

This Appendix provides a list of Interference Analyzer and Channel Scanner messages. Self Test and General Operation error messages are in Appendix A of the User Guide.

A-2 Interference Analyzer Error Messages

- Trace not saved. Please wait for complete sweep and try again.
- Measurement has been turned OFF
- Measurement not valid in Zero Span
- Measurements can not be displayed in Full Screen mode
- The Freq range of the Antenna is invalid for this setup. Please select another Antenna
- DDC Failure
- Lock failed during initialization
- Invalid Attenuation for PreAmp Setting
- Unable to add additional limit points. %d is the maximum.
- Hidden inflection points prevent this action. Decrease Span to reveal hidden points.
- Trace A has no data to view
- Trace B has no data to view
- Trace C has no data to view
- Turning off Trace Overlay
- Only HOLD is valid for Trace C when Trace C is not being updated from A
- Auto Save not available when Time Span is Auto
- The specified Time span is too big to save all measurements. Automatically adjusted Time
- Span to a valid number
- DSP Memory Failure
- Pretune Calibration Failure
- Lock failure %x
- Locking to Internal Ref failed
- Locking to External Ref failed
- Lock attempt Failed
- Timed Measurement Done. Press Reset/Restart Meas to continue measuring
- Current measurement is stopped when Cursor is not zero
- OVER POWER ERROR

- Fatal error, Unknown
- Fatal error, EEPROM failed
- Fatal error, no IA board connected
- Fatal error not decoded by DSP
- UNKNOWN ERROR In IA
- Operation not Permitted in Recall Mode
- Operation not Permitted in this Mode
- Marker must be ON to Use the feature
- Triggering valid only in Zero Span
- Only HOLD is valid for Trace B
- Cannot change average for Recalled/Inactive Traces
- Cannot set Delta Mkr Freq to Demod Freq

A-3 Channel Scanner Error Messages

- Error Recalling Measurement
- Not Available when Max Hold is OFF
- Operation not Permitted in Recall Mode
- ADC Over range: Increase Reference Level
- Mixer Saturation: Increase Attenuation

Index

Numerics

802.11 a, b, g interference 2-21 **A**

ACPR

coverage mapping 7-7
menu, interference analyzer 4-34
menu, spectrum analyzer 2-50
adjacent channel power
field measurements 2-11
measurement 2-16
AM/FM Demod menu
interference analyzer 4-35
spectrum analyzer 2-51
AM/FM/PM analyzer
example FM demod measurement 8-4
general measurement setup 8-2
main topic 8-1
menu map
AM/FM/SSB demodulation
measurement 2-20
Amplitude menu
AM/FM/PM analyzer 8-12
channel scanner 5-11
interference analyzer 4-27
spectrum analyzer 2-33
analysis mode selection $\dots \dots \dots 1-2$
Anritsu service centers 1-1
Anritsu, contact 1-1
antenna calculations 2-12
Application Options
menu spectrum analyzer 2-66
attenuator settings 2-9
Audio Demod
AM (AM/FM/PM) menu 8-22
FM (AM/FM/PM) menu 8-23
Audio Spectrum
AM (AM/FM/PM) menu 8-16
FM (AM/FM/PM) menu 8-18
PM (AM/FM/PM) menu 8-20
Audio Waveform
AM (AM/FM/PM) menu 8-17
FM (AM/FM/PM) menu 8-19
PM (AM/FM/PM) menu 8-21

В

BW menu	
interference analyzer	4-29
spectrum analyzer	2-39

С

-
C/I menu
interference analyzer 4-36
spectrum analyzer 2-52
calculations
antenna
occupied bandwidth (OBW) 2-13
root-mean-square 2-3
carrier to interference ratio (C/I)
field measurements 2-11
measurement 2-21
channel power 2-14
measurement 2-14
measurement, GSM 2-15
Channel Power menu
interference analyzer
spectrum analyzer 2-49
Channel Scan menu
channel scanner
custom setup
introduction
menus 5-6
sample procedure 5-2
script master 5-4
connector care 1-2
contacting Anritsu
coverage manning
ACPR 7-7
default grid 7-6
GPS required 7-1
indoor 7-3
menus 7-11
outdoor 7-2
RSSI 7-7
save JPG 7-10
signal strangth 77
Custom Scan monu 5.19
CW signal generator 61
Un signal generator

D

default grid, coverage mapping 7-6

delta marker	
AM/FM/PM analyzer	-24
interference analyzer 4-	-44
spectrum analyzer	-40
Detection menu	
interference analyzer 4-	-28
spectrum analyzer	-34

Ε

easyMap	tools				•					4-11	, 7-3
emission	mask		•	•			•	•	2-24,	2-53,	4-37

F

=
field strength
antenna calculations
measurements example 2-11
menu, interference analyzer 4-32
menu, spectrum analyzer 2-48
Freq menu
AM/FM/PM analyzer
interference analyzer 4-24
spectrum analyzer 2-31
Freq Scan menu, channel scanner 5-9

G

Gated Sweep menu	
interference analyzer	4-50
Gated Sweep Setup menu	
spectrum analyzer	2-46
GSM channel power	2-15

Н

hear an interfering signa	al 2-20
http, contacting Anritsu	

I
IF signal, zero span 2-5
in-band spurious
measurement 2-19
in-band/out-of-channel
measurement 2-18
indoor coverage mapping 7-3
interference analyzer
measurement options 4-1
menus 4-17
RSSI 4-5
signal ID 4-6
signal strength 4-4
spectrogram 4-2

interference mapping
menu 4-42
submenu key 4-30
interfering signal, AM/FM/SSB demod 2-20

Κ

KML point	\mathbf{s}																		
saving	• •	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	7-8

L

Limit Advanced menu
interference analyzer 4-63
spectrum analyzer 2-65
Limit Edit menu
interference analyzer 4-58
spectrum analyzer 2-60
Limit Envelope menu
interference analyzer 4-61
spectrum analyzer 2-63
Limit menu
interference analyzer 4-56
spectrum analyzer 2-58
Limit Move menu
interference analyzer 4-60
spectrum analyzer 2-62
links
contacting Anritsu 1-1

Μ

mapping
coverage mapping 7-1
easyMap tools4-11, 7-3
interference mapping 4-9
interference mapping menu 4-42
Marker menu
AM/FM/PM analyzer 8-24
interference analyzer 4-44
spectrum analyzer 2-40
Measure menu
interference analyzer 4-37
spectrum analyzer 2-47
measurement mode selection 1-2
Measurements menu
AM/FM/PM analyzer 8-14
channel scanner 5-13
interference analyzer 4-30
·

menu	(AM/FM/PM)
------	------------

Amplitude 8-12
Audio Demod AM 8-22
Audio Demod FM 8-23
Audio Spectrum AM 8-16
Audio Spectrum FM 8-18
Audio Spectrum PM 8-20
Audio Waveform AM 8-17
Audio Waveform FM 8-19
Audio Waveform PM 8-21
Marker
Measurements 8-14
RF Freq 8-9
RF Spectrum
Setup 8-13
Span
Standard List 8-11

menu (Interference Analyzer)
ACPR
AM/FM Demod 4-35
Amplitude 4-27
BW 4-29
С/І 4-36
Channel Power 4-33
Detection 4-28
Edit 4-58
Field Strength 4-32
Frequency 4-24
Gated Sweep 4-50
interference mapping 4-42
Limit 4-56
Limit Advanced 4-63
Limit Envelope 4-61
Limit Move 4-60
Marker 4-44
Marker & Peak 4-45
Marker 2/2 4-46
Measure 2/2 4-37
Measurements 4-30
OCC BW 4-32
Options (Application) 4-64
RSSI 4-40
Signal ID 4-41, 4-43, 7-17, 7-18, 7-19
Signal Strength 4-39
Span 4-26
Spectogram 4-38
Spectrum
Sweep 4-47
Trace 4-52
Trace A Ops 4-53
Trace B Ops 4-54
Trace C Ops 4-55
Trigger 4-49

menu (Spectrum	Anal	vzer)
monu	opcour um	1 MIGI	y ZUL	,

ACPR	2-50
AM/FM Demod	2-51
Amplitude	2-33
Application Options	2-66
BW	2-39
С/І	2-52
Channel Power	2-49
Detection	2-34
Field Strength	2-48
Frequency	2-31
Gated Sweep Setup	2-46
Limit	2-58
Limit Advanced	2-65
Limit Edit	2-60
Limit Envelope	2-63
Limit Move	2-62
Marker	2-40
Measure	2-47
Measure 2/2	2-53
More Peak Options	2-41
OCC BW	2-48
Span	2-35
Sweep	2-43
Sweep Mode	2-44
Trace	2-54
Trace A Ops	2-55
Trace B Ops	2-56
Trace C Ops	2-57
Trigger	2-45
Zero Span IF BW2-37,	2-38
menu map	
AM/FM/PM analyzer	. 8-5
channel scanner	. 5-6
coverage mapping	7-11
interference analyzer	4-17
spectrum analyzer	2-25
More Peak Options	
menu (Spectrum Analyzer)	2-41

0

OCC BW menu	
interference analyzer	4-32
spectrum analyzer	2-48

occupied bandwidth (OBW) AM/FM/PM analyzer OBW method 8-15 calculation methods
one-button smart measurements 2-11
option
25, interference analyzer 4-1
27, channel scanner 5-1
28, CW signal generator3-1, 6-1
31, required for coverage mapping 7-1
31, required for interference mapping
4-9
431, coverage mapping7-1, 7-11
431, required for coverage mapping 2-53
509, AM/FM/PM analyzer 8-1
89, zero span
89, Zero Span described 2-5
90, gated sweep2-4, 2-43, 2-46, 4-47
outdoor coverage mapping 7-2
out-of-band spurious emission
measurement 2-17

Ρ

parts replacement, service centers 1-1
power density, antenna calculations . 2-12 $$
preamplifier settings 2-9

R

RBW to VBW ratio	2
received signal strength indicator 4-5	5
repairs, service centers 1-1	L
resolution bandwidth 2-8	3
RF Freq menu (AM/FM/PM) 8-9)
RF Spectrum menu (AM/FM/PM) 8-15	5
RSSI	
menu 4-40)

S

5	
Safety Symbols	
For Safety Sa	afety-2
In ManualsSa	afety-1
On Equipment	afety-1
save	

interference mapping information 4-15	
JPG, coverage mapping 7-10	
KML points	
limit, SPA 2-65	
location, interference mapping 4-10	
tab delimited points	
Scan Script Master menu 5-10	
Scanner menu 5-7	
script master 5-4	
service centers 1-1	
Setup (AM/FM/PM) menu	
signal ID 4-6	
Signal ID menu 4-41, 4-43, 7-17, 7-18, 7-19	
signal level conversion, antenna calculations	
2-12	
signal strength	
coverage mapping 7-7	
interference analyzer 4-4	
menu 4-39	
smart one-button measurements 2-11	
SPA bandwidth parameters 2-2	
SPA measurements	
Span menu	
AM/FM/PM analyzer 8-10	
interference analyzer 4-26	
spectrum analyzer 2-35	
zero span IF BW keys 2-37	
zero span IF BW keys, MS272xB 2-38	
zero span kevs 2-36	
Span/RBW ratio 2-2	
spectogram	
description	
menu 4-38	
spectrum analyzer menus 2-25	
Spectrum menu	
interference analyzer 4-31	
Standard List menu (AM/FM/PM) 8-11	

sweep
mode 2-3
parameters 2-3
speed 2-9
Sweep menu
interference analyzer 4-47
spectrum analyzer 2-43

Т

V

video bandwidth		2-8
	W	

website, contacting Anritsu		•	•				•	•	•	1-	1
-----------------------------	--	---	---	--	--	--	---	---	---	----	---

Ζ





Anritsu prints on recycled paper with vegetable soybean oil ink.

Anritsu Company 490 Jarvis Drive Morgan Hill, CA 95037-2809 USA http://www.anritsu.com