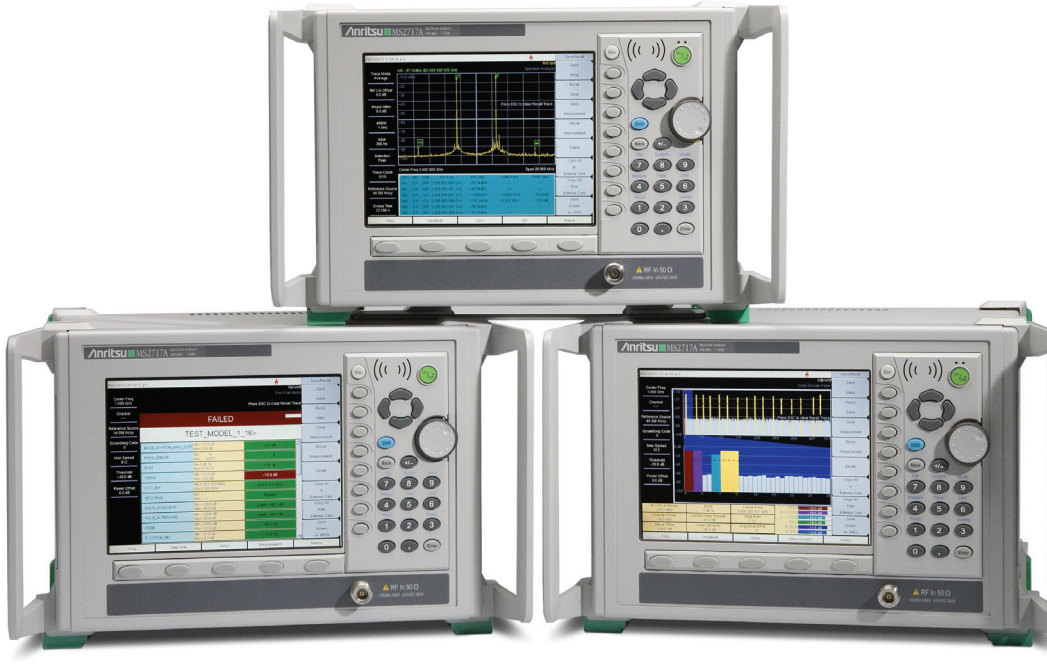
Anritsu

MS2717A

Economy Spectrum Analyzer

Advanced Spectrum Analysis for Manufacturing, R & D and General Purpose Testing

100 kHz to 7.1 GHz



User's Guide

WARRANTY

The Anritsu product(s) listed on the title page is (are) warranted against defects in materials and workmanship for one year from the date of shipment.

Anritsu's obligation covers repairing or replacing products which prove to be defective during the warranty period. Buyers shall prepay transportation charges for equipment returned to Anritsu for warranty repairs. Obligation is limited to the original purchaser. Anritsu is not liable for consequential damages.

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VxWorks Runtime License
2000-1189

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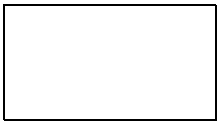
2000-1372

NI Device License
2000-1486



March 2007 10580-00159

 Revision B

产品中有毒有害物质或元素的名称及含量

For Chinese Customers Only YLNB

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 [Cr(VI)]	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷线路板 (PCA)	×	○	×	×	○	○
机壳、支架 (Chassis)	×	○	×	×	○	○
LCD	×	×	×	×	○	○
其他（电缆、风扇、连接器等） (Appended goods)	×	○	×	×	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。

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注）生产日期标于产品序号的前四码(如 S/N 0728XXXX 为 07 年第 28 周生产)。

Equipment marked with the Crossed-out Wheelie Bin symbol complies with the European Parliament and Council Directive 2002/96/EC (the “WEEE Directive”) in the European Union.

For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

DECLARATION OF CONFORMITY

Manufacturer's Name: ANRITSU COMPANY

Manufacturer's Address: Microwave Measurements Division
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA

declares that the product specified below:

Product Name: Economy Spectrum Analyzer

Model Number: MS2717A

conforms to the requirement of:

EMC Directive 89/336/EEC as amended by Council Directive 92/31/EEC & 93/68/EEC
Low Voltage Directive 73/23/EEC as amended by Council directive 93/68/EEC

Electromagnetic Compatibility: EN61326-1:1997 +A1:1998 +A2:2002 +A3:2003

Emissions:	EN55011: 1998 +A1:1999 +A2:2002 Group 1 Class A	
Immunity:	EN 61000-4-2:1995+ A1:1998+ A2:2001	- 4kV CD, 8kV AD
	EN 61000-4-3:2002+ A1:2002	- 3V/m
	EN 61000-4-4:2004	- 0.5kV SL, 1kV PL
	EN 61000-4-5:1995+ A1:2001	- 0.5kV L-L, 1kV L-E
	EN 61000-4-6:1996+ A1:2001	- 3V
	EN 61000-4-11:1994+ A1:2001	- 100% @ 20msec

Electrical Safety Requirement:

Product Safety: EN61010-1: 2001

Eric McLean, Corporate Quality Director

Morgan Hill, CA

5 July 2006
Date

European Contact: For Anritsu product EMC & LVD information, contact Anritsu LTD, Rutherford Close, Stevenage Herts, SG1 2EF UK, (FAX 44-1438-740202)

Safety Symbols Used on Equipment and in Manuals

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

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

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

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

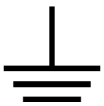
This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

For Safety

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

or



Warning: 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 ⚠

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.

Table of Contents

Chapter 1
General Information

Introduction

This chapter provides a description, performance specifications, optional accessories, preventive maintenance, and calibration requirements for the Anritsu Economy Spectrum Analyzer model listed below. Throughout this manual, this instrument may be referred to as a Spectrum Analyzer.

Model	Frequency Range
MS2717A	100 kHz to 7.1 GHz

Description

The Anritsu Economy Spectrum Analyzer is a synthesizer-based economy spectrum analyzer that provides quick and accurate measurement results. Measurements can be easily made using the main instrument functions: frequency, span, amplitude and bandwidth. Dedicated keys for common functions and a familiar calculator-type keypad are available for fast data entry.

Time and date stamping of measurement data is automatic. The internal memory provides for the storage and recall of more than 1000 measurement setups and more than 1000 traces. The bright, high-resolution color liquid crystal display (LCD) provides easy viewing in a variety of lighting conditions.

The Anritsu Economy Spectrum Analyzer is designed for monitoring, measuring, and analyzing signal environments. A full range of marker capabilities such as peak, center and delta functions are provided for faster, more comprehensive analysis of displayed signals. Upper and lower multi-segmented limit lines are available to create quick, simple pass/fail measurements. A menu option provides for an audible alert when the limit value is exceeded.

Anritsu Master Software Tools, a PC-based software program, provides for storing measurement data. Master Software Tools can also convert the Spectrum Analyzer display into several graphic formats.

Measurements stored in internal memory can be downloaded to a PC using the included USB or Ethernet cables. Once stored, the graphic trace can then be displayed, scaled, or enhanced with markers and limit lines. Historical graphs can be overlaid with current data using the PC mouse in a drag-and-drop fashion. The underlying data can be extracted and used in spreadsheets or for other analytical tasks.

Options

The following options are available for the MS2717A Spectrum Analyzer:

Option	Description
MS2717A-009	Modulation Measurement and Demodulation Hardware Upgrade
MS2717A-044	WCDMA/HSDPA RF Measurements (requires Option 009)
MS2717A-045	WCDMA Demodulator (requires Option 009)

Accessories

The following standard accessories are supplied with the MS2717A:

Part Number	Description
10580-00159	MS2717A User's Guide
2300-498	Master Software Tools Program CD ROM
2000-1360	USB A/5-pin mini-B Cable
2000-1371	Ethernet Cable, 7 feet (213 cm)
2000-1358	64 MB Compact Flash Memory Module

One year Warranty (includes firmware and software)

The following optional accessories are available for the MS2717A:

Part Number	Description
2000-1358	64 MB Compact Flash Memory Module
42N50A-30	30 dB, 50W, Bi-dir., DC-18 GHz, N(m) to N(f) Attenuator
34NN50A	Precision Adapter, DC to 18 GHz, 50W, N(m) to N(m)
34NFNF50	Precision Adapter, DC to 18 GHz, 50W, N(f) to N(f)
15NNF50-1.5B	Test port cable armored, 1.5 meter, N(m) to N(f), 18.0 GHz
15NN50-1.5C	Test port cable armored, 1.5 meter, N(m) to N(m), 6 GHz
15NN50-3.0C	Test port cable armored, 3.0 meter, N(m) to N(m), 6 GHz
15NN50-5.0C	Test port cable armored, 5.0 meter, N(m) to N(m), 6 GHz
15NNF50-1.5C	Test port cable armored, 1.5 meter, N(m) to N(f), 6 GHz
15NNF50-3.0C	Test port cable armored, 3.0 meter, N(m) to N(f), 6 GHz
15NNF50-5.0C	Test port cable armored, 5.0 meter, N(m) to N(f), 6 GHz
15ND50-1.5C	Test port cable armored, 1.5 meter, N(m) to 7/16 DIN(m), 6.0 GHz
15NDF50-1.5C	Test port cable armored, 1.5 meter, N(m) to 7/16 DIN(f), 6.0 GHz
3-806-152	Ethernet Cable, Crossover
2300-498	Master Software Tools Program CD ROM
1091-27	Adapter, Type-N male to SMA female
510-90	Adapter, 7/16 DIN (f) to N(m), DC to 7.5 GHz, 50 ohm
510-91	Adapter, 7/16 DIN (f)-N(f), DC to 7.5 GHz, 50 ohm
510-92	Adapter, 7/16 DIN(m)–N(m), DC to 7.5 GHz, 50 ohm
510-93	Adapter, 7/16 DIN(m)-N(f), DC to 7.5 GHz, 50 ohm
510-96	Adapter 7/16 DIN (m) to 7/16 DIN(m), DC to 7.5 GHz, 50 ohm

Part Number	Description
510-97	Adapter 7/16 DIN(f) to 7/16 DIN(f), 7.5 GHz, 50 ohm
760-240	MS2717A Transit Case
MS2717A-001	Rack Mount Kit (no slides)
10580-00159	Anritsu User's Guide, Model MS2717A
10580-00160	Anritsu Programming Manual, Model MS2717A
10580-00161	Anritsu Maintenance Manual, Model MS2717A

For a complete list of accessories available for the MS2717A, refer to the *MS2717A Spectrum Analyzer Technical Datasheet*, Anritsu part number 11410-00390, available online at www.us.anritsu.com.

Performance Specifications

Frequency

Frequency Range:	100 kHz to 7.1 GHz
Tuning Resolution:	1 Hz
Frequency Reference:	Aging: ±1 ppm/10 years Accuracy: ±1 ppm (25°C ± 25°C) + aging (standard) Accuracy: ±3 ppm (25°C ± 25°C) + aging (Option 9)
Frequency Span:	10 Hz to 7.1 GHz plus 0 Hz (zero span)
Sweep Time:	Minimum 200 ms, 10 µs in zero span
Sweep Trigger:	Free run, Single, Video, External
Resolution Bandwidth:	(–3 dB width) 10 Hz to 3 MHz in 1-3 sequence ± 10%
Video Bandwidth:	(–3 dB) 1 Hz to 3 MHz in 1-3 sequence
SSB Phase Noise:	–100 dBc/Hz max at 10, 20 and 30 kHz offset from carrier –102 dBc/Hz max at 100 kHz offset from carrier
Capture Bandwidth	8 MHz

Amplitude

Measurement Range:	DANL to +30 dBm
Overall Amplitude Accuracy (95%) 20–30ºC, 10 dB input attenuation, preamplifier off, 0 dBm to –50 dBm	±0.9 dB, 100 kHz to 3 GHz ±1.25 dB, >3 GHz to 7.1 GHz

Displayed Average Noise Level (DANL in 10 Hz RBW, 0 dB attenuation, preamp on)

Frequency	Typical	Max
>10 MHz to 1 GHz	–155	–151
>1 GHz to 2.2 GHz	–152	–149
>2.2 GHz to 2.8 GHz	–147	–143
>2.8 GHz to 4.0 GHz	–150	–149
>4.0 GHz to 6.5 GHz	–150	–144
>6.5 GHz to 7.1 GHz	–149	–144

Display Range: 1 to 15 dB/div in 1dB steps. Ten divisions displayed.

Amplitude Units, Log Scale Modes: dBm, dBV, dBmv, dBµV

Attenuator Range: 0 to 65 dB

WCDMA/HSDPA RF Measurements (Option 44, requires Option 9)

Frequency Range	**824–894 MHz, 1710–2170 MHz**	**2300–2700 MHz**
RF Channel Power (15ºC to 30ºC)	±0.7 dB typical (±1.25 dB max)	±0.7 dB typical (±1.25 dB max)
Occupied Bandwidth	±100 kHz	±100 kHz
Residual ACLR[1]	–54 dB typical at 5 MHz offset –59 dB typical at 10 MHz offset	–54 dB typical at 5 MHz offset –57 dB typical at 10 MHz offset
ACLR Accuracy	±0.8 dB ACLRŠ–45 dB at 5 MHz offset ±0.8 dB for ACLRŠ–50 dB at 10 MHz offset	±1.0 dB ACLRŠ–45 dB at 5 MHz offset ±1.0 dB for ACLRŠ–50 dB at 10 MHz offset
Freqency Error	±10 Hz + Time Base Error 99% confidence level	±10 Hz + Time Base Error 99% confidence level

WCDMA Demodulator (Option 45, requires Option 9)

Frequency Range	**824–894 MHz, 1710–2170 MHz**	**2300–2700 MHz**
EVM Accuracy[1]	(3GPP Test Model 4) ±2.5%; EVM £25% (3GPP Test Model 5) ±2.5%; EVM £20%	±2.5% for EVM £20%
Residual EVM	2.5% typical	2.5% typical
Code Domain Power	±0.5 dB for code channel power Š25 dB 16, 32, 64 DCPH (test model 1) 16, 32 DCPH (test model 2, 3)	±0.5 dB for code channel power Š25 dB 16, 32, 64 DCPH (test model 1) 16, 32 DCPH (test model 2, 3)
CPICH (dBm)	±0.8 dB typical	±0.8 dB typical
Scrambling Code	3 seconds	3 seconds

[1] Depends on reference level, input signal level and single channel conditions.

General

Max Continuous Input:	10 dB attenuation, +30 dBm, ±50 VDC
RF Input VSWR:	2.0:1 maximum, 1.5:1 typical (Š10 dB attenuation)
Interfaces	Type N female RF Connector BNC female connectors for ext reference and ext trigger RJ45 connector for Ethernet 10/100-Base T USB 2.0 (full-speed) Compact Flash 2.5 mm 3-wire cellular headset connector
Environmental:	MIL-PRF-28800F class 2 Operating: –10º C to 55º C, humidity 85% Storage: –51º C to 71º C Altitude: 4600 meters, operating and non-operating
AC Input Power	90V to 250 VAC, 50-60 Hz, 400 VA maximum
Electromagnetic Compatibility:	Meets European Community requirements for CE marking.
Size:	372 x 242 x 339 mm (14.7 x 9.6 x 13.4 in.)
Weight:	5.6 kg (< 12 lbs.) typical

For a complete list of MS2717A specifications, refer to the *MS2717A Spectrum Analyzer Technical Datasheet*, Anritsu part number 11410-00390, available online at www.us.anritsu.com.

Preventive Maintenance

MS2717A preventive maintenance consists of cleaning the unit and inspecting and cleaning the RF connector on the instrument and all accessories. Clean the MS2717A with a soft, lint-free cloth dampened with water or water and a mild cleaning solution.

CAUTION

To avoid damaging the display or case, do not use solvents or abrasive cleaners.

Clean the RF connectors and center pins with a cotton swab dampened with denatured alcohol. Visually inspect the connectors. The fingers of N(f) connectors and the pins of N(m) connectors should be unbroken and uniform in appearance. If you are unsure whether the connectors are good, gauge the connectors to confirm that their dimensions are correct.

Calibration Requirements

The MS2717A loads factory calibration data during start-up, eliminating the need for daily calibration checks.

Although the MS2717A does not require daily calibration, Anritsu recommends annual calibration and performance verification by local Anritsu service centers. Anritsu service centers are listed in this chapter.

ESD Cautions

The MS2717A, like other high performance instruments, is susceptible to ESD damage. Very often, coaxial cables and antennas build up a static charge, which, if allowed to discharge by connecting directly to the MS2717A without discharging the static charge, may damage the MS2717A input circuitry. MS2717A operators should be aware of the potential for ESD damage and take all necessary precautions.

Operators should exercise practices outlined within industry standards such as JEDEC-625 (EIA-625), MIL-HDBK-263, and MIL-STD-1686, which pertain to ESD and ESDS devices, equipment, and practices. As these apply to the MS2717A, it is recommended that any static charges that may be present be dissipated before connecting coaxial cables or antennas to the MS2717A. This may be as simple as temporarily attaching a short or load device to the cable or antenna prior to attaching to the MS2717A. It is important to remember that the operator may also carry a static charge that can cause damage. Following the practices outlined in the above standards will ensure a safe environment for both personnel and equipment.

Replacing the Line Fuse

The MS2717A line fuse value is printed on the rear panel next to the power connector.

CAUTION

Before changing the fuse, always remove the power cord from the power outlet. There is a risk of receiving a fatal electric shock if the fuse is replaced with the power cord connected. Always use a new fuse of the type and rating specified by the fuse markings on the rear panel of the instrument.

To replace the line fuse:

Step 1. Turn off the rear panel power switch and disconnect the MS2717A from the power source.

Step 2. Using a small flat-blade screwdriver, carefully pry under the tab above the rear panel power switch to open the cover and gain access to the fuse holders (refer to the figure below).

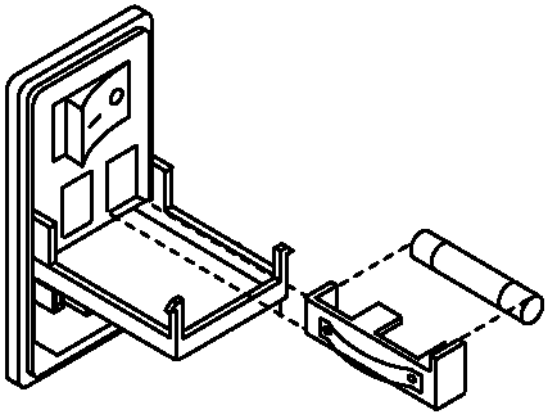


Figure 1-1. Replacing the Line Fuse

Step 3. Slide the fuse out of the fuse holder.

Step 4. If the fuse is defective, replace the fuse with a new fuse of the type and rating specified by the fuse markings on the rear panel of the instrument.

Step 5. Reinstall the fuse holder in the rear panel power connector.

Step 6. Close the cover to secure the fuse holder in place. The cover will close with an audible snap.

Step 7. Reconnect the MS2717A to the power source and turn on the rear panel power switch.

Rack Mount Kit

The MS2717A Rack Mount Kit (part number MS2717A-001) allows the unit to be mounted to a standard 19-inch equipment rack. Follow the instructions below to install the kit.

Step 1. Turn off the rear panel power switch and disconnect the MS2717A from the power source.

Step 2. Using a small flat blade screwdriver, carefully pry the cover plates from the front sides of the unit to expose the rack mount bracket mounting holes.

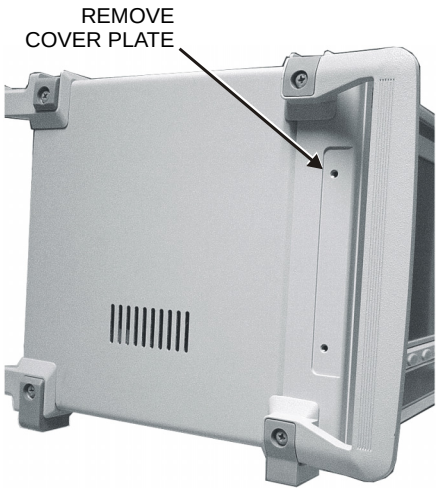


Figure 1-2. Rack Mount Bracket Mounting Holes

Step 3. Align the rack mount brackets (part number 65642) with the screw holes and insert the mounting screws (905-2620) as shown. Tighten using a #1 Phillips screw driver.

Figure 1-3. Insert the Mounting Screws

Step 4. Repeat the process on the other side. The unit is ready to be mounted into an instrument rack.

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Chapter 2
Quick Start Guide

Introduction

This chapter provides a brief overview of the Anritsu MS2717A Spectrum Analyzer. The intent of this chapter is to provide a starting point for making basic measurements. For more detailed information, see Chapter 3, *Key Functions* and Chapter 4, *Measurement Fundamentals*.

Turning the MS2717A On for the First Time

No initial setup is required. After unpacking, the MS2717A is ready for use. The MS2717A is equipped with automatic line-power sensing and will operate with line voltages from 90V to 250 VAC, at 50-60 Hz, 400 VA maximum. The MS2717A is intended for Installation Category (Over Voltage Category) II.

Step 1. Connect the AC line cord to the AC Input on the rear panel of the instrument and to an adequate mains supply.

CAUTION

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

Step 2. Switch the AC Power rocker switch on the rear panel to "1" to apply the line voltage to the power supply.

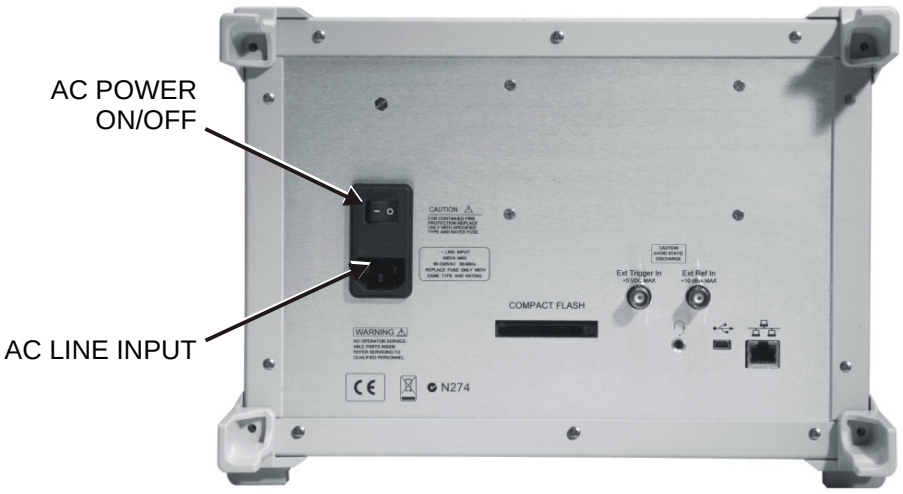

Figure 2-1. MS2717A AC Input

Step 3. Set the instrument to Operate by pressing the illuminated Standby/Operate (On/Off) front panel button.

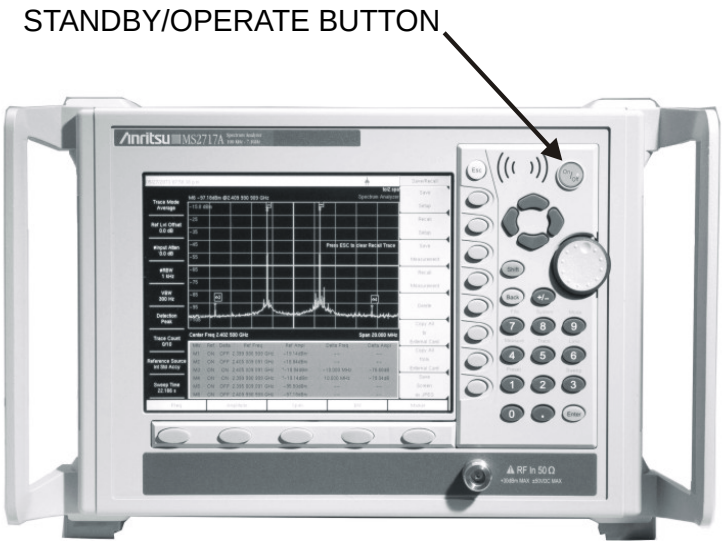

Figure 2-2. MS2717A On/Off Button

The MS2717A takes about forty-five seconds to complete power up and load the application software. At the completion of this process, the instrument is ready to use.

For information on making measurements with the Spectrum Analyzer, refer to “Making a Spectrum Analyzer Measurement,” later in this chapter. For advanced applications, refer to Chapter 4, *Measurement Fundamentals*, and Chapter 5, *Transmitter Measurements*.

Front Panel Overview

The menu-driven interface is easy to use and requires little training. Hard keys on the front panel are used to initiate function-specific menus. There are five function hard keys located below the display. In Spectrum Analyzer mode, the function hard keys are: **Freq** (Frequency), **Amplitude**, **Span**, **BW** (Bandwidth) and **Marker**. In WCDMA Signal Analyzer mode, the function hard keys are: **Freq** (Frequency), **Amplitude**, **Setup**, **Measurements** and **Marker**.

There are 21 hard keys and a rotary knob located to the right of the display. Eight of the hard keys are dual purpose, depending on the current mode of operation. The dual-purpose keys are labeled with a number on the key itself, and the alternate function printed on the panel above the key. Use the shift key to access the functions printed on the panel. The **Escape** key, used for aborting data entry, is the round button located above the soft keys. The rotary knob and the keypad can both be used to change the value of an active parameter.

There are also eight soft keys to the right of the display which change function depending upon the current menu selection. The current soft key function is indicated in the active function block to the right of the display. The locations of the different keys are shown in Figure 2-2, below.

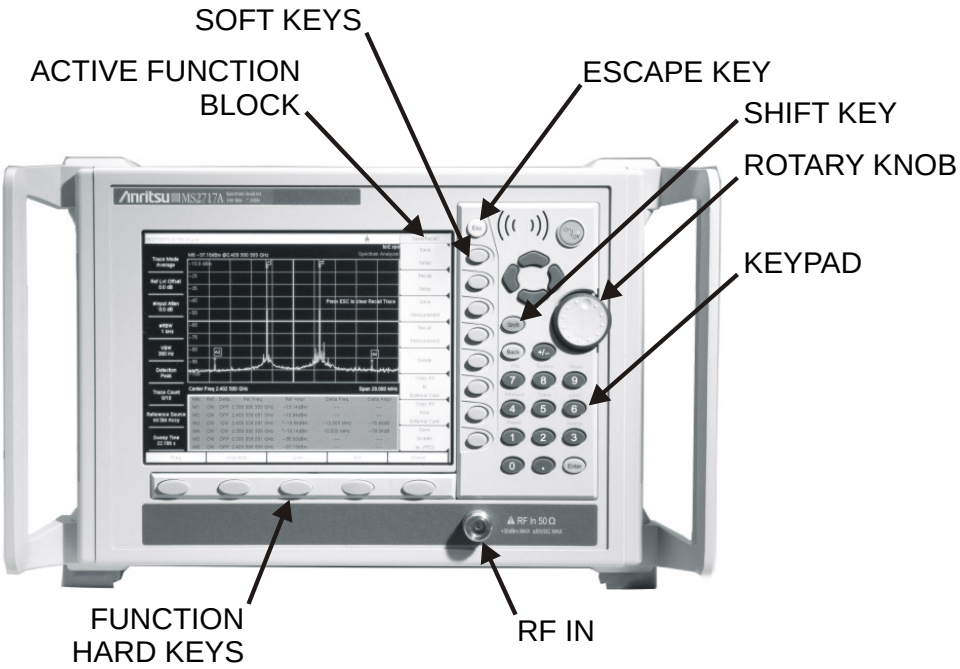

Figure 2-3. MS2717A Overview

Ventilation Ports

It is important to keep the ventilation ports on the top and sides of the intrument clear of obstructions at all times for proper ventilation and cooling of the instrument.

Display Overview

Figure 2-3 illustrates some of the key information areas of the MS2717A display. Refer to Chapter 3, *Key Functions*, for more detailed key descriptions.

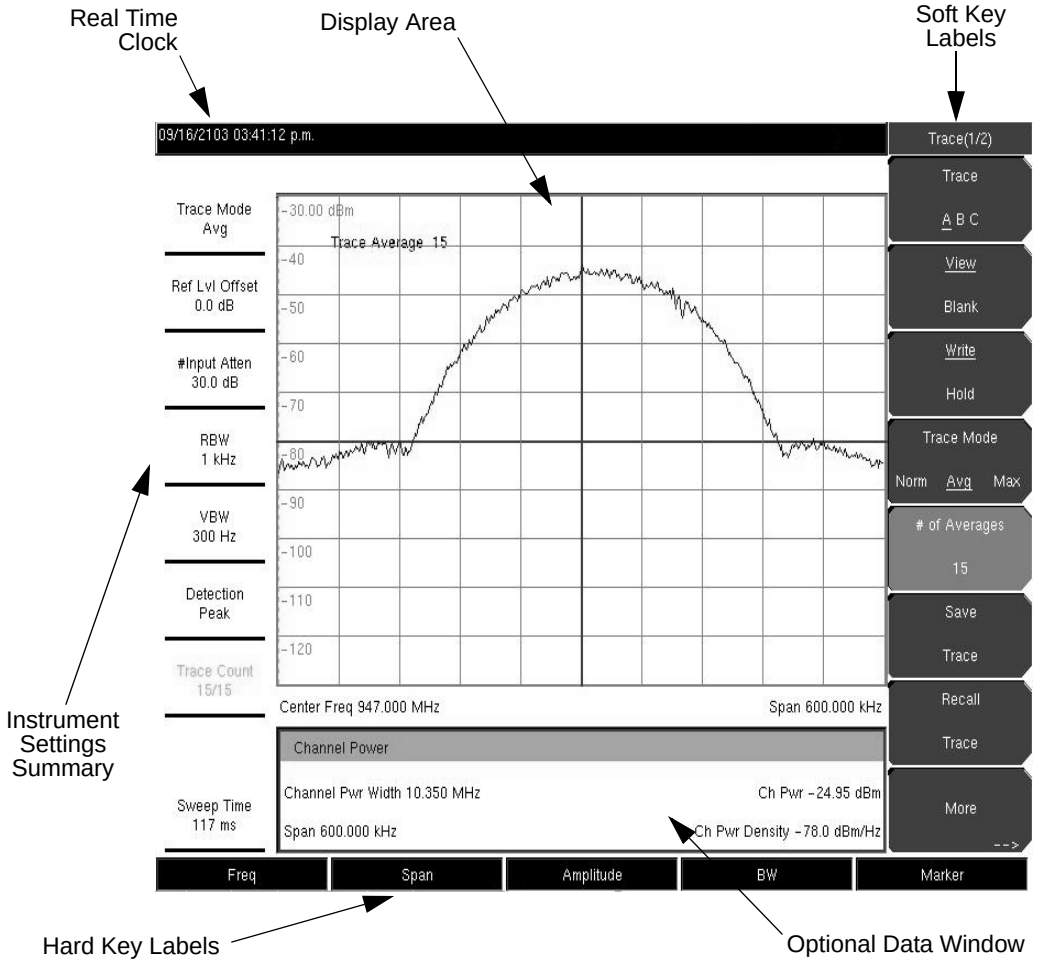

Figure 2-4. Display Overview

Back Panel Connectors

The connectors and indicators located on the back panel are shown in Figure 2-4 and described below.

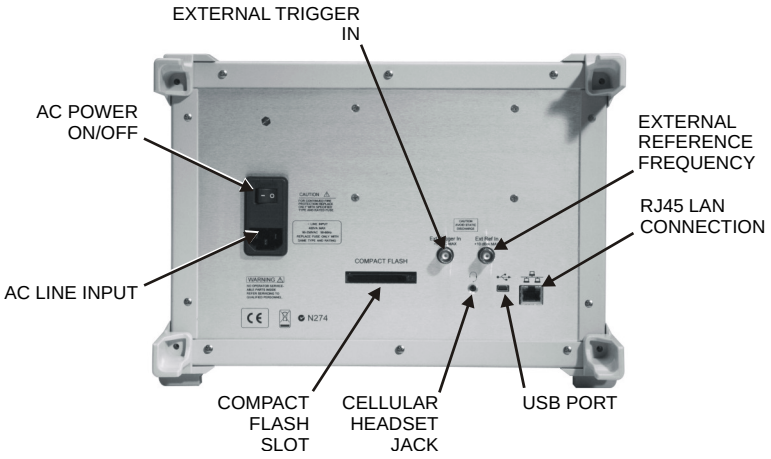

Figure 2-5. Back Panel Connectors

CAUTION

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. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock. The MS2717A is equipped with automatic line-power sensing and will operate with line voltages from 90V to 250 VAC, at 50-60 Hz, 400 VA maximum.

LAN Connection

The RJ-45 connector is used to connect the MS2717A to a local area network. Integrated into this connector are two LEDs. The amber LED indicates the presence of LAN voltages—a live LAN connection—while the green LED flashes to show that LAN traffic is present. The instrument IP address is set by pressing the **Shift** key, then the **System** (8) key followed by the System Options soft key and the Ethernet Config soft key. The instrument Ethernet address can be set automatically using DHCP, or manually by entering the desired IP address, gateway address and subnet mask.

Dynamic Host Configuration Protocol (DHCP) is an Internet protocol that automates the process of setting IP addresses for devices that use TCP/IP, and is the most common method of configuring a device for network use. To determine if a network is set up for DHCP, connect the MS2717A to the network and select DHCP protocol in the Ethernet Config menu.

Turn the MS2717A off, and then on. If the network is set up for DHCP, the assigned IP address should be displayed briefly after the power up sequence.

To display the IP address with the instrument on, press the **Shift** key, then the **System** key, then the System Options soft key and the Ethernet Config soft key. The IP address will be displayed as shown in Figure 2-5.

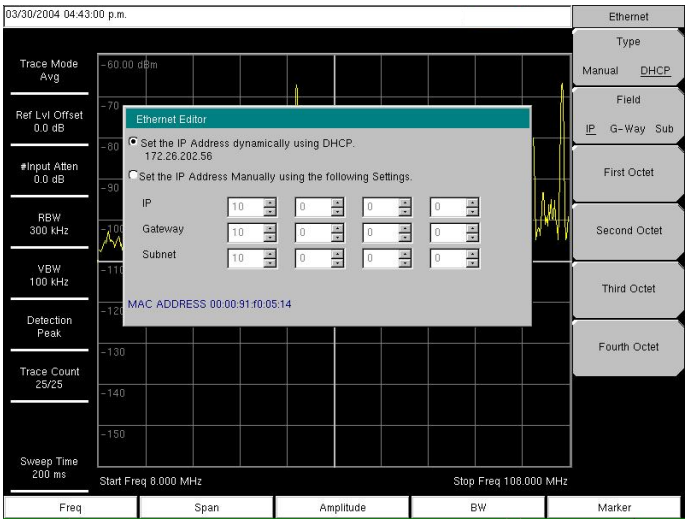

Figure 2-6. IP Address Assigned Using DHCP

More about DHCP

DHCP stands for Dynamic Host Configuration Protocol. It is a protocol that allows a server to dynamically assign IP addresses to devices that are connected to the network. Most networks include a DHCP server to manage IP addresses. When a DHCP server is available on the network, DHCP is the preferred IP address mode.

When using DHCP, no setup is required to lease and use a dynamic IP address. In a dynamic IP operation, the IP address in use may change from use to use. The DHCP server hands out IP addresses on a first come, first served basis. As soon as the device is disconnected from the network, the IP address that it was using becomes available to lease to the next unit requesting an IP address. Normally there is some amount of lag time on the DHCP server end, so if the device is connected again reasonably soon, it may end up with the same address.

NOTE: The MS2717A must be connected to the network *before* it is turned on for DHCP to work. Key elements of the DHCP lease are only performed during the instrument's startup operations, or when switching from manual to DHCP.

When a DHCP server is not available, a Static IP address can be used. A Static IP address is a fixed address. Once set, it will always remain the same and care must be taken to not conflict with other equipment on the network.

When using a static IP address on an established network, always request a Static IP address from the network administrator. Randomly choosing a Static IP address on an established network may result in duplicate IP addresses or other conflicts.

Three parameters must be set prior to using a Static IP address:

IP Address
This is the Static IP address on the network.

Default Gateway
Often when a static IP address is assigned, a default gateway is also identified. If the default gateway is unknown, type in the Static IP address so that the Static IP address and Default Gateway are the same number.

Subnet Mask
This parameter is usually extracted from the Static IP address based on the class of the address and determines the destination of any broadcast messages that might be sent from the instrument. It can be customized if necessary. The subnet mask may also be provided with the Static IP address.

Example 1

In this example, a Static IP address has been chosen because there is no network available. The instrument is connected to the network port on the PC with a crossover Ethernet cable (not included). This is also referred to as Direct Connect:

IP Address: 10.0.0.2
Default Gateway: 10.0.0.2
Subnet Mask: 255.255.0.0

Example 2

In this example, the Static IP address has been assigned with an associated gateway and subnet mask:

IP Address: 153.56.100.42
Default Gateway: 153.56.100.1
Subnet Mask: 255.255.252.0

There are a few tools built into the Microsoft Windows operating system that can assist in making some determinations about the network the PC is plugged into. Typing ipconfig at a command prompt will display information about the in-use parameters of the PC and its network connection. Below is an example of the typical results expected.

NOTE: The ipconfig display does not report if the information is from a DHCP server or a Static IP setup.

```
Y:\>ipconfig
Windows 2000 IP Configuration
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix. : us.anritsu.com
IP Address. . . . . . . . . . . . : 172.26.202.172
Subnet Mask . . . . . . . . . . . : 255.255.252.0
Default Gateway . . . . . . . . . : 172.26.200.1
```

Another tool that can find out if a selected IP address is already on the network is ping. Ping is a harmless way to determine if an address is found on the network, and if it is found, for it to reply. Greatly simplified, ping sends out a request to a specific address to determine if it is there. If it is found, it will respond by sending back what was sent to it. If it is not found, the response will be "request timed out" meaning that there was no reply from that IP address.

```
Y:\>ping 172.26.202.172
Pinging 172.26.202.172 with 32 bytes of data:
Reply from 172.26.202.172: bytes=32 time<10ms TTL=128
Reply from 172.26.202.172: bytes=32 time<10ms TTL=128
Reply from 172.26.202.172: bytes=32 time<10ms TTL=128
Reply from 172.26.202.172: bytes=32 time<10ms TTL=128
```

Ping statistics for 172.26.202.172:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

USB Interface

The USB 2.0 interface can be used to connect the MS2717A directly to a PC. The first time the MS2717A is connected to a PC, the normal USB device detection by the computer operating system will take place. The CD-ROM shipped with the instrument contains a driver for Windows 2000 and Windows XP that is installed when Master Software Tools is installed. Drivers are not available for earlier versions of the Windows operating system. During the driver installation process, place the CD-ROM in the computer drive and specify that the installation wizard should search the CD-ROM for the driver.

Cellular Headset Jack

The cellular headset jack provides audio output from the built-in AM/FM/SSB demodulator and other audio signals for testing and troubleshooting wireless communication systems. The jack accepts a 2.5 mm 3-wire miniature phone plug such as those commonly used with cellular telephones.

Ext Trigger

A TTL signal applied to the External Trigger female 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.

Ext Freq Ref

BNC female connector for connection of an external frequency reference or external trigger. Select the Ext Ref Freq soft key under the System menu to select the frequency of the external reference from the list presented. Valid frequencies are 1 MHz, 1.2288 MHz, 1.544 MHz, 2.4576 MHz, 4.8 MHz, 4.9152 MHz, 5 MHz, 9.8304 MHz, 10 MHz, 13 MHz and 19.6608 MHz at amplitude from -10 dBm to +10 dBm.

RF In

50W Type-N female connector.

Compact Flash

The MS2717A is shipped with a 64 MB Compact Flash Memory Module, Anritsu Part Number 2000-1358. The removable compact flash card can be any size, although it must be a minimum of 64 MB to be able to hold the entire contents of the internal flash memory.

Making Spectrum Analyzer Measurements

Required Equipment

- MS2717A Economy Spectrum Analyzer
- Optionally, an appropriate RF signal generator

Making a Measurement

To make a measurement, locate and display the signal(s) of interest by selecting the desired frequency, span, and amplitude value, as explained below.

> NOTE: In most cases, information and parameters can be entered into the MS2717A 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 soft 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. There are 551 pixels across the screen in normal mode and 661 pixels in full-screen mode. Choose whichever method is most convenient to enter the required information.

Step 1. Connect the input signal or antenna to the RF In test port.
Step 2. Press the **Freq** key to display the Frequency menu.
Step 3. To enter a center frequency, select the Center Freq soft key and enter the desired center frequency.
Step 4. To set a specific frequency band, select the Start Freq soft key and enter the desired start frequency, then select the Stop Freq soft key and enter the desired stop frequency.
Step 5. Press the **Span** key to display the Span menu and enter the span, or for a full span, select the Full Span soft key. Selecting a full span will override any previously set Start and Stop frequencies. For a single frequency measurement, select the Zero Span soft key.

> NOTE: To quickly move the span value up or down, select the Span Up 1-2-5 or Span Down 1-2-5 soft keys. These keys facilitate a zoom-in, zoom-out in a 1-2-5 sequence.

Setting the Amplitude

Step 1. Press the **Amplitude** key.

> NOTE: To change the current measurement units, press the Units soft key and select the required units from the soft keys presented. Press the Back soft key to return to the Amplitude menu.

Step 2. Press the Reference Level soft key and use the Up/Down arrow keys or the keypad to set the reference level. Press **Enter** to set the reference level.
Step 3. Press the Scale soft key and use the Up/Down arrow keys or the keypad to enter the desired scale. Press **Enter** to set the scale.

> NOTE: The Scale parameter cannot be changed when linear units are selected (Watts or Volts).
> Press the Amplitude soft key and select Auto Atten coupling of the attenuator setting and the reference level to help ensure that harmonics and spurs are not introduced into the measurements. See *Attenuator Functions* (page 4-2) for more information.

Selecting a Signal Standard

Selecting a signal standard sets the center frequency, channel spacing, integration bandwidth and span for the first channel of the selected standard. Appendix A contains a table of the signal standards available in the instrument.

To select a signal standard:

Step 1. Press the **Freq** key to display the Frequency menu.
Step 2. Press the Signal Standard soft key and use the Up/Down arrow keys or the rotary knob to highlight the desired signal standard. Press **Enter** to select the highlighted signal standard.
Step 3. Press the Channel# soft key to choose the required channel. By default, if a channel number has not yet been entered, the lowest channel number for that standard is automatically selected. The channel numbers that can be selected correspond to the channel numbering schemes of the various signal standards.

Setting Bandwidth Parameters

Both resolution bandwidth (RBW) and video bandwidth (VBW) can be automatically or manually coupled to the frequency span. That is, the wider the span, the wider the RBW. The ratio of the span width to the resolution bandwidth is 300:1 by default, and if necessary, can be changed as follows:

Step 1. Press the BW key.
Step 2. Select the Span/RBW soft key. The current Span/RBW ratio is shown as part of the soft key label. Change the value using the keypad, the directional arrows or the rotary knob.

When auto coupling between the span and the RBW is selected, it is indicated on the left side of the display as RBW XXX, where XXX is the bandwidth value. If manual RBW coupling is selected, a "#" is shown in front of RBW on the left side of the display, and the resolution bandwidth can be adjusted independently of the span. If a non-existent resolution bandwidth is entered, the instrument will select the next higher resolution bandwidth. If a value greater than the widest RBW is entered, the widest RBW will be selected.

Auto coupling of the VBW links the video bandwidth to the resolution bandwidth, so that the wider the RBW, the wider the VBW. Auto coupling is indicated on the left side of the display as VBW XXX. If manual VBW coupling is selected, a "#" is shown in front of VBW on the left side of the display, and the video bandwidth can be adjusted independently of the RBW. If a non-existent video bandwidth is entered, the instrument will select the next higher video bandwidth. If a value greater than the widest VBW is entered, the widest VBW will be selected.

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

Setting Sweep Parameters

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

Single/Continuous

When this soft 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 soft key is pressed or another triggering mode is selected.

Trigger Type

To select a specific type of triggering, press the Trigger Type soft 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 -120 dBm to +20 dBm. 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.

Change Trigger Position

This soft 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 portio/n of the trace before the trigger event is displayed very quickly since 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.

Chapter 3
Key Functions

Introduction

This chapter describes the MS2717A keys and how to use them. The major key sections are arranged in alphabetical order with soft key menus under those key selections listed in the order they appear on the instrument, from top to bottom.

There are five function hard keys located below the display. In Spectrum Analyzer mode, the function hard keys are: **Freq** (Frequency), **Amplitude**, **Span**, **BW** (Bandwidth) and **Marker**. In WCDMA Signal Analyzer mode, the function hard keys are: **Freq** (Frequency), **Amplitude**, **Setup**, **Measurements** and **Marker**. There are 21 hard keys and a rotary knob located to the right of the display. Eight of the hard keys are dual purpose, depending on the current mode of operation. The dual-purpose keys are labeled with a number on the key itself, and the alternate function printed on the panel above the key. Use the shift key to access the functions printed on the panel. The **Escape** key, used for aborting data entry, is the round button located above soft keys. The rotary knob and the keypad can both be used to change the value of an active parameter. There are also eight soft keys to the right of the display which change function depending upon the current menu selection.

Amplitude

The Amplitude hard key is located below the display. The Amplitude menu soft keys are:

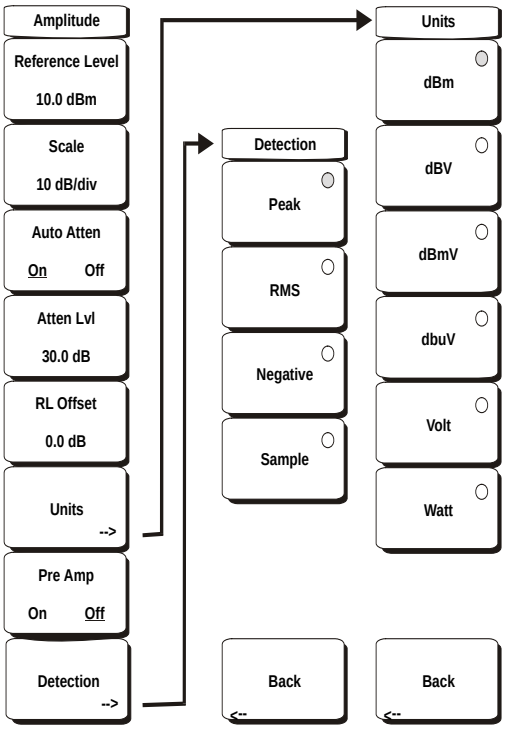

Figure 3-1. Amplitude Menu Soft Keys

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 key pad, using the ± key as the minus sign. After entering the value press the dBm soft 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 detent.

The reference level value may be modified by the reference level offset value, discussed later in this chapter.

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 Up/Down arrow keys.

Auto Atten On/Off

Input attenuation can be either tied to the reference level (On) or manually selected (Off). When input attenuation is tied to the reference level, attenuation is increased as higher reference levels are selected to make sure the instrument input circuits are not saturated by large signals that are likely to be present when high reference levels are required.

Atten Lvl

Input attenuation can be set from 0 to 65 dB, in 5 dB steps. Select this soft key and use the keypad, the rotary knob or the Up/Down arrow keys to change the attenuation value. When the Preamplifier is turned on, the allowed attenuation settings are 0 and 10 dB.

RL Offset

Reference Level Offset compensates for the presence of input attenuation or gain external to the instrument. 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 offset value is being entered.

Units

Select the display units from the soft key menu shown on page 3-1. Press the Back soft key to return to the Amplitude menu.

Pre Amp On/Off

This soft key turns the low-noise front-end preamplifier on or off. The preamplifier lowers the noise floor by approximately 25 dB. To assure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be <-50 dBm.

BW (Bandwidth)

The **BW** hard key is located below the display. The BW menu soft keys are:

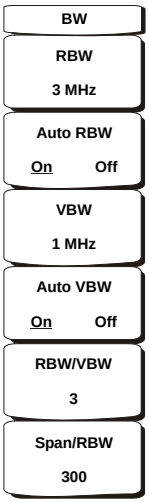

Figure 3-2. BW Menu Soft Keys

RBW

The current resolution bandwidth value is displayed in this soft key. The RBW can be changed using the keypad, the Up/Down 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

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 soft key.

VBW

The current video bandwidth value is displayed in this soft key. The VBW can be changed using the keypad, the Up/Down arrow keys, or the rotary knob. The range is 1 Hz to 3 MHz in a 1-3 sequence.

Auto VBW

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 soft key.

RBW/VBW

This soft key displays the ratio between resolution bandwidth and video bandwidth. To change the ratio, select this soft key and use the keypad, the Up/Down arrow keys, or the rotary knob to select a new ratio. The default ratio is 3.

Span/RBW

This soft 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, select this soft key and use the keypad, the Up/Down arrow keys, or the rotary knob to select a new ratio.

File

To access the functions under the File menu, select the **Shift** key, then the **File** (7) key. The File menu soft keys are:

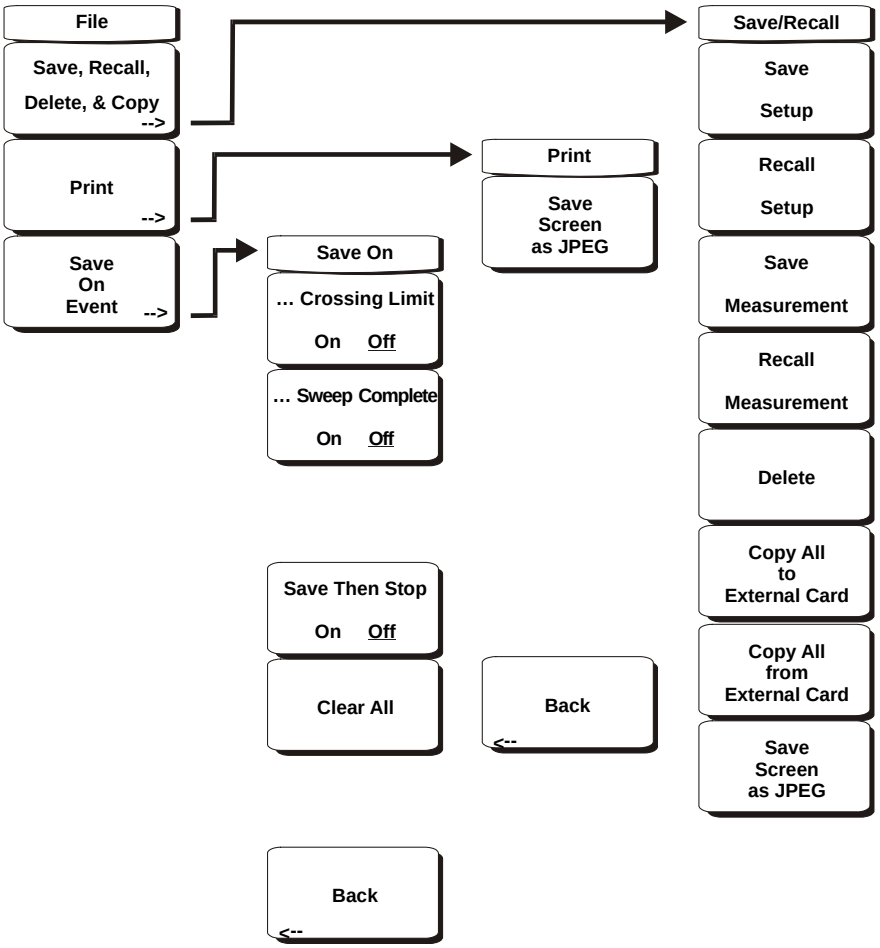

Figure 3-3. File Menu Soft Keys

Save / Recall

Selecting this soft key opens a list of save and recall function soft keys, as explained below.

Save Setup

Opens a dialog box to name and save the current operating settings, allowing them to be recalled later to return the instrument to the state it was in at the time the setup was saved. The saved setup can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the setup.

Recall Setup

This soft key brings up a selection box that allows selection and recall of a previously stored instrument setup. Use the rotary knob or the Up/Down arrow keys to highlight the saved setup, and press **Enter**, the rotary knob, or the Recall soft key to select. All

current instrument settings are replaced by the stored setup information. Press the **Esc** key to cancel the recall.

Save Measurement

Initiates a dialog box to name and save the current active trace A. The saved measurement trace can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the measurement trace.

NOTE: If a measurement has been previously saved, the Save Measurement dialog box will open with the previously saved name displayed with an automatically incremented suffix. For instance, if the previously saved trace was named Trace, the next measurement saved will be named Trace (1), and so on. To save the new measurement with this name, simply press **Enter**. To save the new measurement with a similar name, press the Right directional arrow and add the changes. To create a completly new name, use the keypad, the rotary knob or select the soft key for each letter.

Recall Measurement

Brings up a selection box that allows recall of a previously stored measurement trace. Use the rotary knob or the Up/Down arrow keys to highlight the saved measurement trace, and press **Enter**, the rotary knob, or the Recall soft key to select. A recalled trace may be displayed as trace A, in place of the live trace, or as trace B or C along with the live trace. Use the rotary knob or the Up/Down arrow keys to highlight the recalled trace option, and press the **Enter** key to select. Press the **Esc** key to cancel the recall.

To remove a recalled measurement trace from the screen, select the **Shift** key and the **Trace** (5) key to open the Trace menu. Use the Trace soft key to select the trace to be removed from the screen and use the View/Blank soft key to view or blank the trace. Use the Trace key to select an active trace after blanking a recalled trace.

Delete

Brings up a selection box that shows all stored setups and traces. The list shows the setup or trace name, the type (stp for a saved setup, spa for a saved trace, jpg for a JPEG file) and the date and time the information was saved. Use the rotary knob or the Up/Down arrow keys to highlight the saved information, and press **Enter**, the rotary knob, or the Delete soft key to delete. Press the Delete All soft key to delete all saved information. Press the **Esc** key to cancel the operation.

Copy All to External Card

This function copies all stored setups and measurements from the internal memory to an external Compact Flash memory card.

Copy All from External Card

This function copies all measurements and setups from an external Compact Flash memory card into the instrument internal memory.

Save Screen as JPEG

This function saves a measurement trace as a graphics file. The saved measurement can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the measurement after entering the file name. The file is saved in the internal memory with the specified name, with .jpg appended.

Print

The Print key can be used to save a measurement trace as a graphics file. This file can then be downloaded to a PC using Master Software Tools and printed.

Save Screen as JPEG

This function saves a measurement trace as a graphics file. The saved measurement can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the measurement after entering the file name. The file is saved in the internal memory with the specified name, with .jpg appended.

Back

The Back key returns to the previous menu.

Save On Event…

The instrument can be configured to automatically save a measurement if a selected condition is satisfied. Approximately 1500 measurements can be saved before the memory is full.

… Crossing Limit On/Off

When Crossing Limit is On, and an upper or lower limit line is set, if any point in a measurement exceeds either the upper or lower limit line, the measurement is automatically saved at the end of the sweep. The saved measurement is named "LIM" followed by the date and time in the format: LIMyyyymmddhhmmss. The time value in the file name will generally be slightly earlier than the measurement time stamp shown in the file list, since the file name is created at the time the limit violation is noted and the time stamp is the time at which the measurement file is actually saved.

If a limit line has not been set, selecting this soft key results in the on-screen message: "You must have a limit ON first."

… Sweep Complete On/Off

When Sweep Complete is On, the measurement is automatically saved at the end of a sweep. This is particularly useful for very slow sweeps. The saved measurement is named "EOS" with a file name in the format: EOSyyyymmddhhmmss.

Save Then Stop On/Off

When the Save Then Stop soft key is set to On, the instrument will save just one measurement when the Crossing Limit or Sweep Complete soft keys are set to On, and the qualifying event occurs. Sweeping stops after a measurement is saved. If it is set to Off, sweeping continues after a measurement is saved and more measurements may be saved. The default for this selection is Off.

NOTE: This feature should be used with care. With Save Then Stop set to Off (the default) a large number of measurements can be saved when the Crossing Limit or Sweep Complete soft keys are set to On, making it time-consuming to retrieve saved measurements or to delete unwanted measurements. When there are many saved measurements, the time required to display a file list can be several minutes.

Clear All

Pressing this soft key turns off both save on event conditions and sets Save then Stop to Off, the default state.

Back

Returns to the top-level file menu.

Freq (Frequency)

The tuning frequency range for the MS2717A can be entered in several different ways depending on 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. The **Freq** hard key is located below the display. The Freq menu soft keys are:

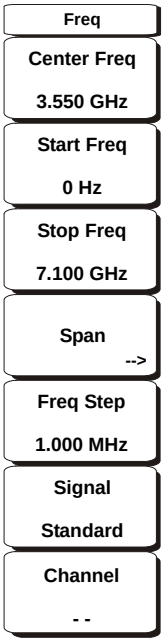

Figure 3-4. Freq Menu Soft Keys

Center Frequency

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

NOTE: When using the up and down arrows, the frequency moves in steps defined by the value entered using the Freq Step soft 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 (661 points in full-screen mode).

Start Frequency

Press the **Freq** key followed by the Start Freq soft 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 Frequency

Press the **Freq** key followed by the Stop Freq soft 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** key followed by the Span soft key and enter the desired span. The Span menu is used to set the frequency range over which the instrument will sweep. For the MS2717A, the span can be set from 10 Hz to 7.1 GHz. Span can also be set to zero span.

The soft 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 Up/Down arrow keys, the span changes by the value of the Frequency Step for each key press.

Freq Step

Press the **Freq** key followed by the Freq Step soft key to enter the desired frequency step size. The frequency step specifies the amount by which a frequency will change when the Up/Down arrow keys pressed. The center frequency, start frequency, and stop frequency values are affected by the value of Freq Step. The active parameter will be changed by the frequency step when the Up/Down arrow keys are pressed. If Freq Step is the active parameter, nothing happens when the UP/Down arrow keys are pressed. The frequency step size can be any value from 1 Hz to 7.1 GHz with a resolution of 1 Hz.

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

Signal Standard

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

When a signal standard is selected, the center frequency and span for the first channel of the particular standard is automatically tuned. Other settings, such as channel spacing and integration bandwidth, are also automatically entered. Appendix A contains a table of the signal standards that are in the instrument firmware.

Channel

Use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the spectrum analyzer display.

Limit

To access the functions under the Limit menu, select the **Shift** key, then the **Limit** (6) key. The Limit menu soft keys are:

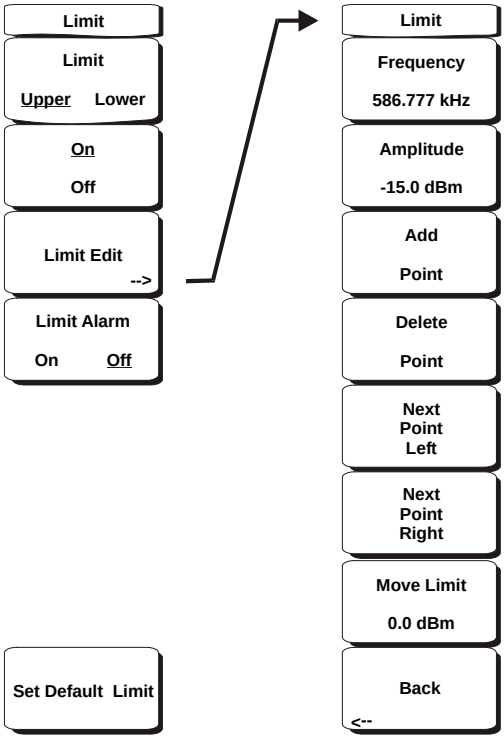

Figure 3-5. Limit Menu Soft Keys

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. Limit alarm failures are reported whenever a signal is above the upper limit line or below the lower limit line.

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

Limit Upper/Lower

This soft key selects which limit line will be active for editing. The limit line that is currently selected for editing is underlined.

On/Off

This soft key turns the active limit line (upper or lower) on or off.

Limit Edit

A submenu is displayed by this soft key that allows the creation or editing of single or multi-segment limit lines. The currently active limit point is marked by a red circle on the display.

Frequency

The frequency of each point in a limit line can be individually set. When a new point is added, it takes on a value halfway between two existing points, or the stop frequency of the current sweep if there is no point higher in frequency than the one being added. See the Add Point soft key description for more details. Use the keypad, the Left/Right arrow keys or the rotary knob to change the frequency of a point.

Amplitude

The amplitude of each limit point can also be individually set. By default, when a new point is added, it takes on the amplitude that is on the limit line at the frequency where the point was added. Use the keypad, using the ± key as the minus sign, 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 soft key description for more details.

Add Point

The behavior of this soft key depends on which limit point is active at the time the key is pressed. If the active limit point is located somewhere in the middle of a multi-segment limit line, a new limit point will be added that is halfway between the currently active point and the point immediately to its right. The amplitude of the point will be such that it falls on the limit line. For example, if there is a limit point at 2.0 GHz with an amplitude of -30 dBm and the next point is 3.0 GHz with an amplitude of -50 dBm, 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 soft keys.

If the last limit point is active (and not at the right edge of the display) the new limit point will be placed at the right edge of the display at the same amplitude as the currently active point.

Points may not be added beyond the current sweep limits of the instrument.

Delete Point

This soft key deletes the currently active point. The active point becomes the one immediately to the left of the point that was deleted.

Next Point Left

This soft key selects the limit point immediately to the left of the active point, making it active for editing or deletion. With each key press, the indicator of which point is active moves one limit point to the left until it reaches the left edge of the screen.

Next Point Right

This soft key selects the limit point immediately to the right of the active point, making it active for editing or deletion. With each key press, the indicator of which point is active moves one limit point to the right until it reaches the right edge of the screen.

Move Limit

If the limit line is in its default state, the limit line will be set to the value entered. If the limit line has been changed from its default settings, the entire single- or multi-segment limit line can be moved up or down by the amount entered. Values can be entered using the keypad, the Up/Down arrow keys, or the rotary knob. The units for this amount will be the current display units as selected under the **Amplitude** menu.

Back

Returns to the higher-level Limit menu.

Limit Alarm

This soft key selects, for the currently active limit line, if an alarm beep will occur when a data point exceeds the limit.

Set Default Limit

This soft key deletes all limit points for the currently active limit line and defaults to a single limit whose amplitude value will be selected to make it visible on the screen. The other limit line is not altered.

Marker

Press the **Marker** function hard key to open the Marker menu. The MS2717A is equipped with six markers. Any or all markers can be employed simultaneously. The **Marker** hard key is located below the display. The Marker menu soft keys are:

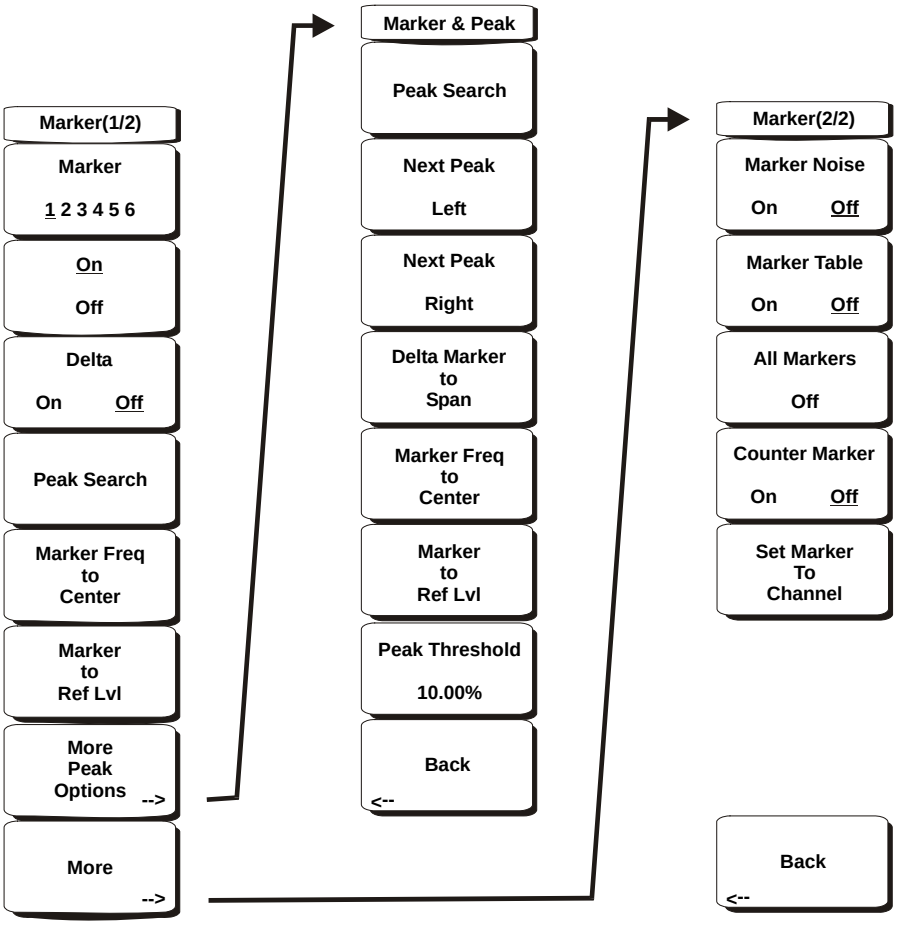

Figure 3-6. Marker Menu Soft Keys

Marker 1 2 3 4 5 6

Use this soft key to select the active marker. The underlined marker number is the active marker. Each press of the soft key moves the underline to the next marker number.

On/Off

This soft key turns the active marker, selected by the Marker soft key above, on or off.

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

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

Marker Freq to Center
This soft key changes the center frequency to place the currently active marker at the center of the display.

Marker to Ref Level
This soft key causes the amplitude of the currently active marker to become the reference level, which is the top horizontal line of the display.

More Peak Options
This soft key brings up a secondary menu of soft keys for more peak searching options.

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

Next Peak Left
From the current position of the active marker, the instrument searches to the left (toward lower frequencies) for a peak signal that rises at least a certain amount above the previous valley. If no such peak is found, the marker is placed at the left end of the trace. The Peak Threshold soft key allows the user to specify the performance of peak searching.

Next Peak Right
From the current position of the active marker, the instrument searches to the right (toward higher frequencies) for a peak signal that rises at least a certain above the previous valley. If no such peak is found, the marker is placed at the right end of the trace. The Peak Threshold soft key allows the user to specify the performance of peak searching.

Delta Marker to Span
Sets the total span width to the value of the delta marker. If the delta marker is zero, the span is set to 10 Hz. If there is no delta marker, or the delta marker value is set to less than 10 Hz, then the span will be set to 10 Hz.

Marker Freq to Center
Sets the center frequency to the frequency of the currently active marker.

Marker to Ref Lvl
Sets the amplitude of the currently active marker to the top graticule line as the reference level.

Peak Threshold
This soft key allows the user to specify how far above the average noise floor a signal must rise before it is considered a peak.

Back
Returns to the higher-level menu.

More
Opens a submenu of further Marker options.

Marker Noise

This marker option 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

Pressing this soft key 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

This soft key turns off all markers and the marker table.

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 1 Hz.

Set Marker to Channel

Opens a dialog box to enter a channel within the currently active signal standard. The active marker will move to the center of the selected channel.

Back

Returns to the previous menu.

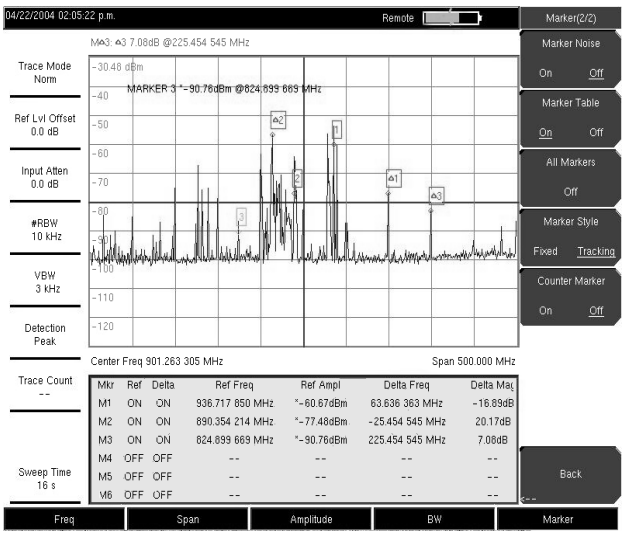

Figure 3-7. Markers

NOTE: When using the up and down arrows, the active marker moves in steps defined by the value entered using the Freq Step soft key (page 3-8). When using the left or right arrow keys, the active marker moves by one division.

Measure

To access the functions under the Measure menu, select the **Shift** key, then the **Measure** (4) key. The Measure menu soft keys are:

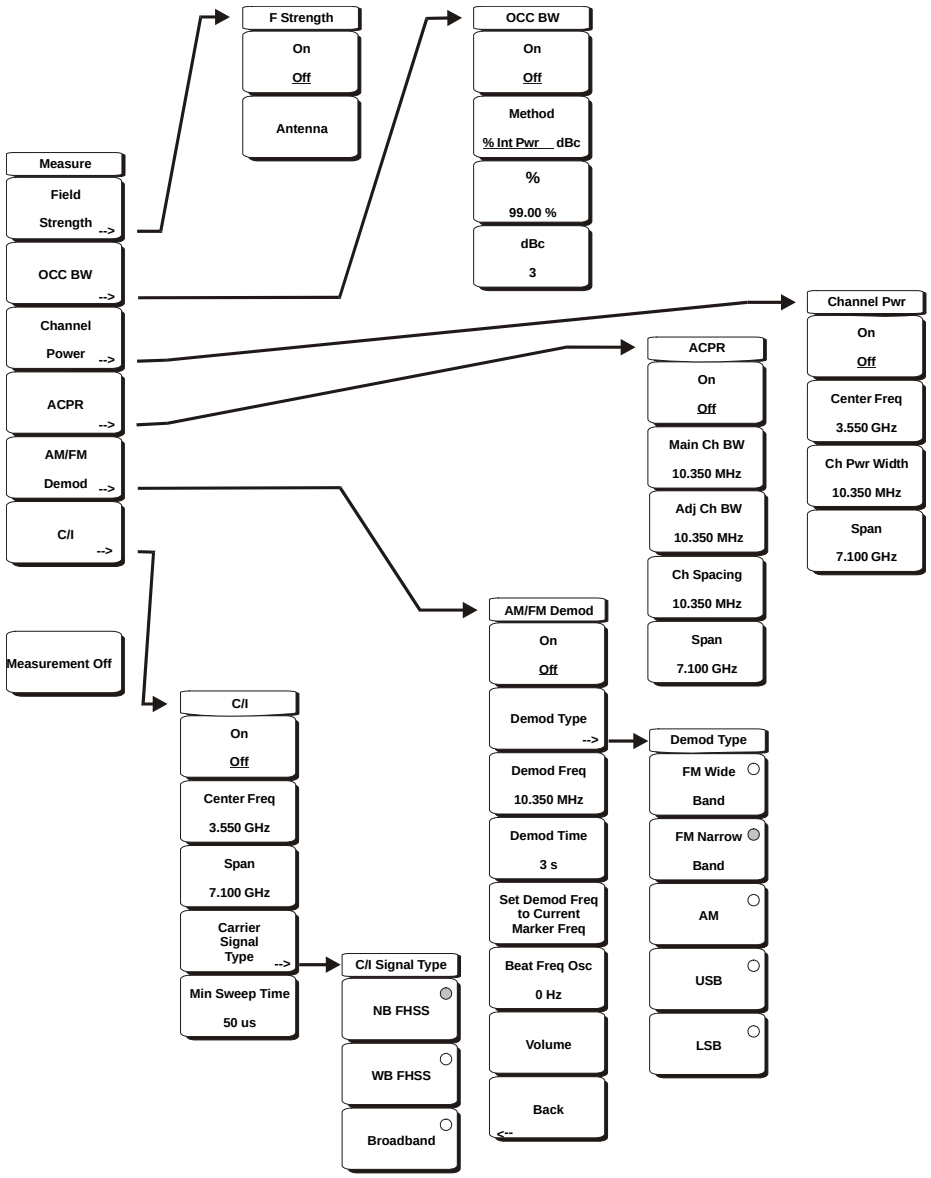

Figure 3-8. Measure Menu Soft Keys

Field Strength

This measurement allows the use of an antenna with known gain characteristics and measures the field strength over the frequency range of the antenna in units of dBm/meter, dbV/meter, dBmV/meter, dBµV/meter, volts/meter or watts/meter.

On Off

Turns field strength measurements on or off.

Antenna

This soft key brings up a dialog box that lists all the antennas for which the instrument has data, including both standard antennas and custom antenna 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 previous menu.

OCC BW

Activates the occupied bandwidth menu. Select either % or dBc method of occupied bandwidth measurement.

Method % Down/dBc Down

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

%

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

dBc

Use the keypad, the directional arrow keys or the rotary knob to enter the dBc value (0 to 120 dB).

Back

Returns to the previous menu.

Channel Power

Activates the Channel Power measurement function. Channel Power and Channel Power Density are measured based on the selection in the Units menu.

On Off

Begins or ends the channel power measurement. When the measurement is on, the Channel Power information box 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 selecting the Detection soft key.

Center Freq

Activates the center frequency function, and sets the center frequency of the Spectrum Analyzer for the channel power measurement. Use the keypad, the directional arrow keys or the rotary knob to enter the center frequency.

Ch Pwr Width

Sets the integration bandwidth for channel power measurement. Use the keypad, the directional arrow keys or the rotary knob to enter the integration bandwidth.

Span

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

Back

Returns to the previous menu.

ACPR

Accesses a menu of Adjacent Channel Power Ratio measurement options:

On Off

Begins or ends the ACPR measurement.

Main Ch BW

Sets the bandwidth of the main channel for ACPR measurement. Use the keypad, the directional arrow keys or the rotary knob to enter the a specific frequency. When using the keypad, select the GHz, MHz, kHz, or Hz soft key to accept the frequency input.

Adj Ch BW

Sets the bandwidth of the adjacent channels for ACPR measurement. Use the keypad, the directional arrow keys or the rotary knob to enter the a specific frequency. When using the keypad, select the GHz, MHz, kHz, or Hz soft key to accept the frequency input.

Ch Spacing

Sets the channel spacing between the main and adjacent channels. Use the keypad, the directional arrow keys or the rotary knob to enter the a specific frequency. When using the keypad, select the GHz, MHz, kHz, or Hz soft key to accept the frequency input.

Back

Returns to the previous menu.

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.

On Off

Turns AM/FM Demodulation on or off.

Demod Type

Provides soft keys to select the type of signal to be demodulated:

FM Wide Band
FM Narrow Band
AM
USB
LSB

Demod Freq

Use the keypad, the directional arrow keys or the rotary knob to enter the center frequency of the signal to be demodulated. This frequency does not have to be within the current frequency sweep range to which the instrument is set.

Demod Time

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

Set Demod Freq to Current Marker Freq

Sets the demodulation frequency to the frequency of the current marker.

Beat Freq Osc

Sets the beat frequency of the oscillator to exactly set the demodulation frequency of USB and LSB signals.

Volume

The current volume setting is displayed on the screen. Use the Up/Down arrow keys or rotary knob to change the volume, and press the **Enter** key to select.

Back

Returns to the previous menu.

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.

On Off

Starts and stops the carrier to interference measurement.

Center Freq

Use the keypad, the directional arrow keys or the rotary knob to enter the center frequency.

Span

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

Carrier Signal Type

Opens a menu to select the carrier signal type.

NB FHSS (Narrow Band Frequency Hopping Spread Spectrum)

Use this setting when the signal being measured is 802.11b.

WB FHSS (Wide Band Frequency Hopping Spread Spectrum)

Use this setting when the signal being measured is 802.11a or 802.11g.

Broadband

Use this setting when the signal being measured is a digital modulation format such as CDMA, GSM, etc.

Back

Returns to the previous menu.

Min Sweep Time

Set the minimum sweep time for the measurement.

Back

Returns to the previous menu.

Mode

To access the functions under the Mode menu, select the **Shift** key, then the **Mode** (9) key. Use the rotary knob or Up/Down arrow key to highlight the desired mode, then press **Enter** to select.

Preset

To access the functions under the Preset menu, select the **Shift** key, then the **Preset** (1) key. The Preset menu soft keys are:

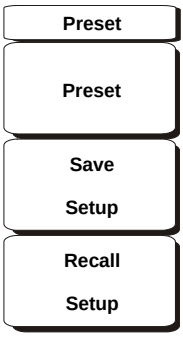

Figure 3-9. Preset Menu Soft Keys

Preset

This key resets the instrument to the default starting conditions of full band sweep, 10 dBm log reference level, 10 dB/division scaling, 0 dB reference level offset, all measurements turned off and trigger set to free run.

Save Setup

Opens a dialog box to name and save the current operating settings, allowing them to be recalled later to return the instrument to the state it was in at the time the setup was saved. The saved setup can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the setup.

Recall Setup

This soft key brings up a selection box that allows selection and recall of a previously stored instrument setup. Use the rotary knob or the Up/Down arrow keys to highlight the saved setup, and press **Enter**, the rotary knob, or the Recall soft key to select. All current instrument settings are replaced by the stored setup information. Press the **Esc** key to cancel the recall.

Span

The Span menu is used to set the frequency range over which the instrument will sweep. For the MS2717A, the span can be set from 10 Hz to 7.1 GHz. The Span can also be set to zero span.

Press the **Span** function key located below the display to access the Span menu. The Span menu soft keys are:

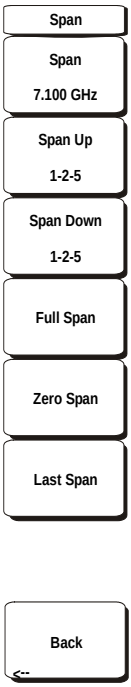

Figure 3-10. Span Menu Soft Keys

Span

This soft key shows the current value for span in units of GHz, MHz, kHz or Hz. When the Span button is pressed, span becomes the active parameter and may be changed. Use the keypad, the directional arrow keys or the rotary knob to increase or decrease the span frequency. If the span is changed by using the up and down arrow keys, the span changes by the value of the Frequency Step entered in the Frequency menu.

Span Up 1-2-5

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

Span Down 1-2-5

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

Full Span
Pressing this button sets the span to cover the entire tunable spectrum of the MS2717A from 0 Hz to 7.1 GHz.

Zero Span
This soft 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 the signal and the tester would walk around the access point usable area while the Spectrum Analyzer records the amplitude using slow sweep.

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

Back
Returns to the previous menu.

Sweep

To access the functions under the Sweep menu, select the **Shift** key, then the **Sweep** (3) key. The Sweep menu soft keys are:

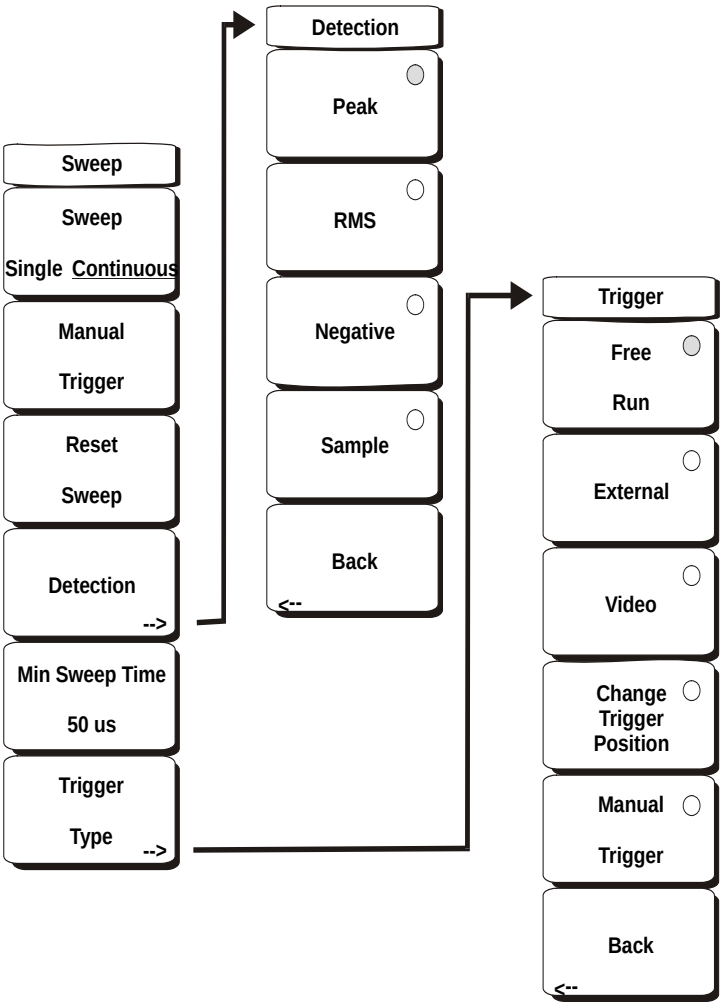

Figure 3-11. Sweep Menu Soft Keys

Sweep Single/Continuous

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

Manual Trigger

Pressing this soft key causes the instrument to make a single sweep when the instrument is in single sweep mode. This key has no function when the instrument is in continuous sweep mode.

Reset Sweep

This soft key stops the current sweep, clears trace averaging results, clears the maximum hold results, if selected, and restarts the sweep at the left side of the screen.

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.

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 since 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 previous menu.

Min Sweep Time

This function allows a minimum sweep time to be specified. Use the keypad, the directional arrow keys or the rotary knob to set the minimum sweep time from 200 microseconds to 4294 seconds. When using the keypad, the available time units are minutes, seconds, milliseconds and microseconds.

If the required sweep time for accurate measurement is longer than the specified minimum, then the time required for accurate measurements will prevail.

Trigger Type

Sets the type of trigger to be used.

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 -120 dBm to +20 dBm. 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 available only in Zero Span.

Change Trigger Position

This soft 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 since 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 available only in Zero Span.

Back

Returns to the previous menu.

System

To access the functions under the System menu, select the **Shift** key, then the **System** (8) key. The System menu soft keys are:

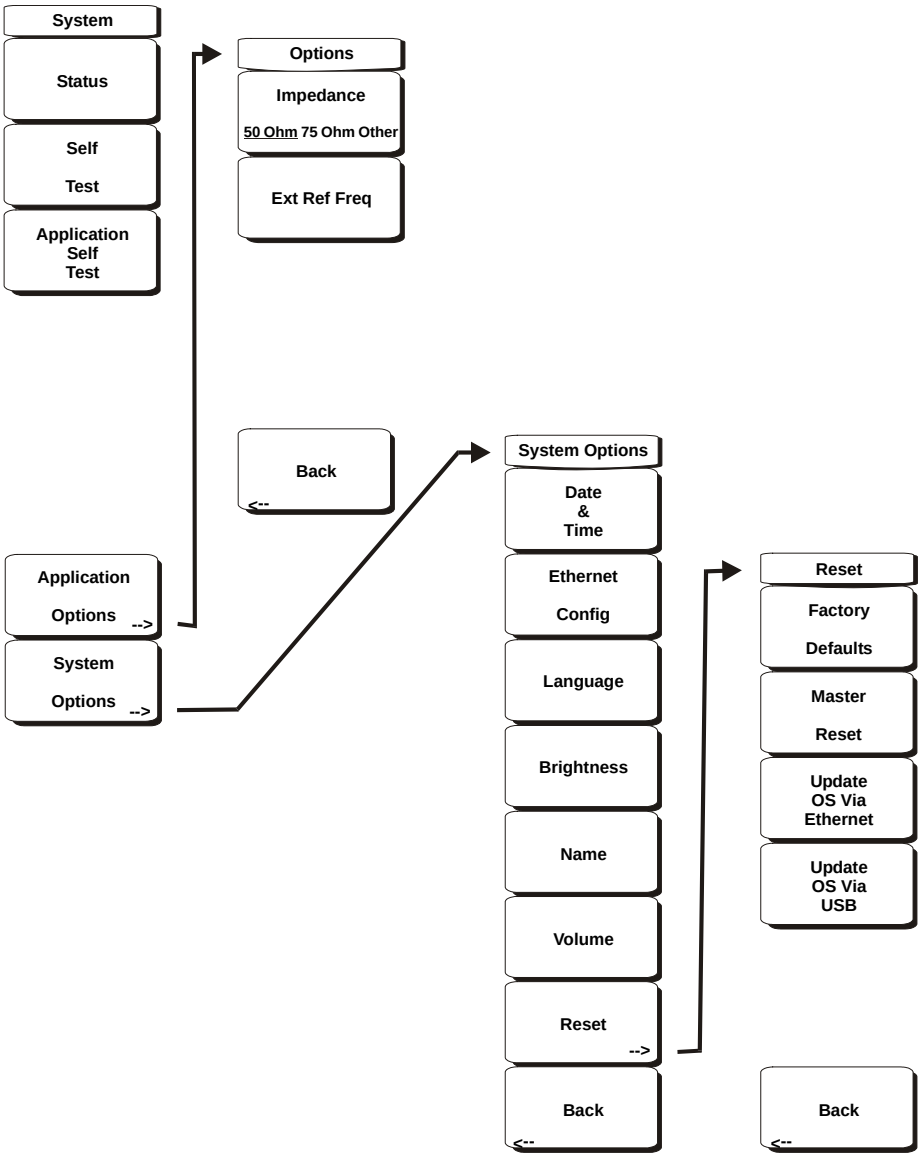

Figure 3-12. System Menu Soft Keys

Status
Pressing this soft key displays the current system status, including the operating system and firmware versions, temperatures and other details. Press **Esc** or **Enter** to return to normal operation.

Self Test
This soft key initiates a series of diagnostic tests that test the components of the instrument. A display will list the individual tests with a pass or fail indication. Press **Esc** or **Enter** to return to normal operation.

Application Self Test
This soft key initiates a series of diagnostic tests related to the performance of the spectrum analyzer. A display will list the individual tests with a pass or fail indication. Press **Esc** or **Enter** to return to normal operation.

Application Options
This soft key presents a menu to select application options.

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

Ext Ref Freq
Select the frequency of the external reference from the list presented. Valid frequencies are 1 MHz, 1.2288 MHz, 1.544 MHz, 2.4576 MHz, 4.8 MHz, 4.9152 MHz, 5 MHz, 9.8304 MHz, 10 MHz, 13 MHz and 19.6608 MHz at amplitude from -10 dBm to +10 dBm.

Back
Returns to the previous menu.

System Options
This key opens a selection of system option soft keys.

Date and Time
This soft key brings up a dialog box for setting the current date and time. Use the soft keys or the Left/Right arrow keys to select the field to be modified. Use the keypad, the Up/Down arrow keys or the rotary knob to select the date and time. Select **Enter** to accept the changes, or press the **Esc** key to return to normal operation without changing anything.

Ethernet Configuration
This soft key brings up a dialog box to set the IP address of the instrument.

Type Manual/DHCP
This softkey selects whether the address will be entered manually, or supplied automatically by a network DHCP server. If Manual is selected, use the soft keys or the Left/Right arrow keys to select the field to be modified. Use the keypad, the Up/Down arrow keys or the rotary knob to enter the input. Select **Enter** to accept the changes, or press the **Esc** key to return to normal operation without changing anything.

Language
This soft key brings up a selection box allowing selection from a list of built-in languages for the MS2717A displays. The languages currently available are English, French, German, Spanish, Japanese, Chinese, Korean, and Italian. In addition, a custom language may be selected if it has been defined using the Master Software Tools software and loaded into the MS2717A. The only limit regarding the number of lan-

guages that may be loaded into the instrument is the amount of space available in the memory. Select **Enter** to accept the change, or press the **Esc** key to return to normal operation without changing anything.

Brightness

The brightness of the display can be adjusted to optimize viewing under a wide variety of lighting conditions. Use the keypad, the Up/Down arrow keys or the rotary knob to select a brightness level from 1 to 9, 9 being the brightest. Select **Enter** to accept the change.

Name

Opens a dialog box to name the instrument. The unit can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the name.

Volume

The current volume setting is displayed on the screen. Use the keypad, the Up/Down arrow keys or the rotary knob to change the volume and press the **Enter** key to accept the change.

Reset

Opens a menu of reset and update options.

Factory Defaults

Restores the instrument to the factory default values, indluding Ethernet, language and brightness settings. Press the **Enter** key to initiate the reset, and turn the unit off, then on again to complete. Press **Esc** to return to normal operation without resetting.

Master Reset

This will restore factory setting to all system parameters, including Time/Date, Ethernet, language and brightness settings. Also, all user files in the internal memory are deleted, and the original language and antenna files are restored. Press the **Enter** key to initiate the reset, and turn the unit off, then on again to complete. Press **Esc** to return to normal operation without resetting.

Update OS Via Ethernet

Select this soft key to update the instrument operating system via the Ethernet connection. Press Enter to begin the update, or press **Esc** to return to normal operation without updating.

Update OS Via USB

Select this soft key to update the instrument operating system via the USB connection. Press Enter to begin the update, or press **Esc** to return to normal operation without updating.

Back

Returns to the previous menu.

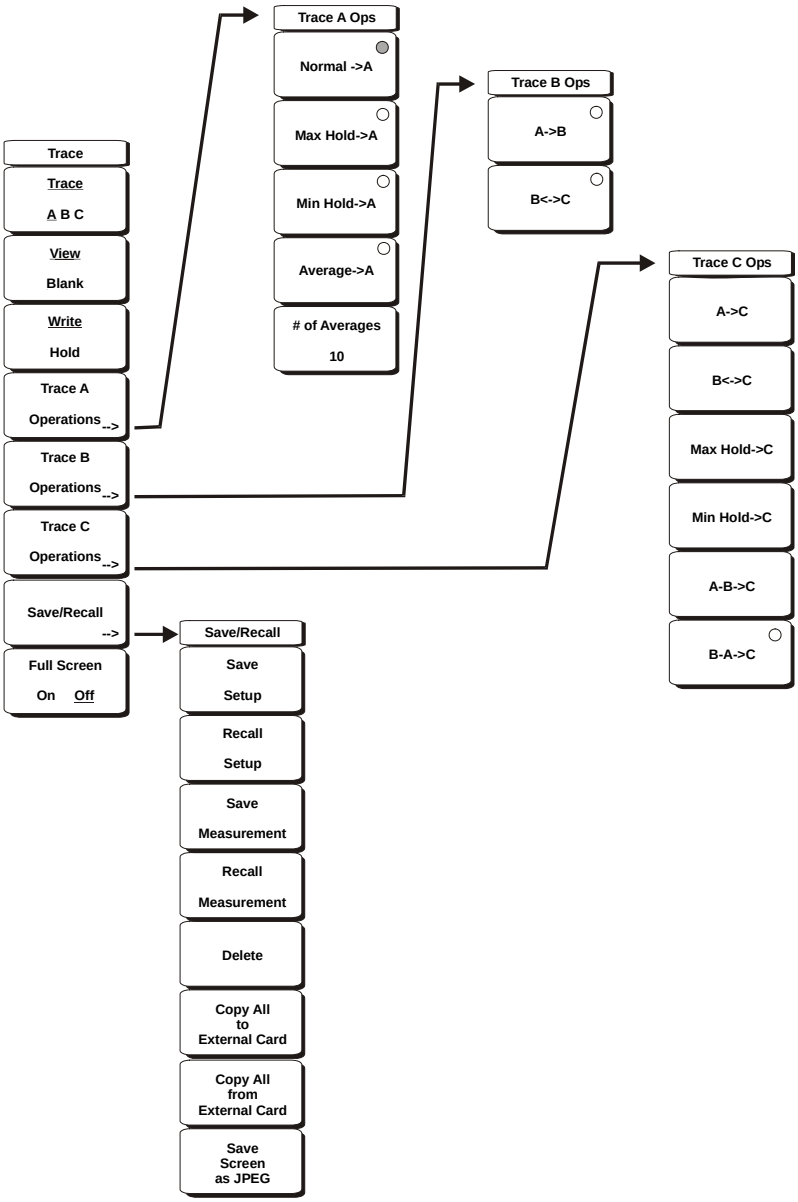

Figure 3-13. Trace Menu

To access the functions under the Trace menu, select the **Shift** key, then the **Trace** (5) key. The MS2717A is capable of displaying up to three traces, one with live data, and the other two either with stored data or trace math data.

Trace A, B, C

This soft key selects which trace is the active trace. The active trace is the one that is underlined. As the key is pressed, the underline advances from A to B to C and back to A.

View Blank

This soft key toggles the currently active trace to be either visible or hidden.

Write/Hold
Selects if the currently active trace will continue to sweep and be updated or to hold the current trace on screen. This is not applicable to traces B or C unless trace math involving trace A is active.

Trace A Operations
This soft key activates a menu of functions available for Trace A.

Normal ->A
Displays the current trace data as Trace A.

Max Hold ->A
Trace A shows the cumulative maximum value of each display point over many traces.

Min Hold ->A
Trace A shows the cumulative minimum value of each display point over many traces.

Average ->A
Trace A shows a running average of a number of traces. The number of traces averaged is set using the # of Averages soft key.

of Averages
Sets the number of traces used for calculating averge display from 1 to 65535.

Trace B Operations
This soft key activates a menu of functions available for Trace B.

A->B
Copies the contents of Trace A to Trace B, overwriting the previous contents of Trace B.

B<->C
Exchanges the contents of Traces B and C.

Trace C Operations
This soft key activates a menu of functions available for Trace C.

A->C
Copies the contents of Trace A to Trace C, overwriting the previous contents of Trace B.

B<->C
Exchanges the contents of Traces B and C.

Max Hold ->C
Trace C shows the cumulattive maximum value of each display point over many traces. Trace A is unaffected.

Min Hold ->C
Trace C shows the cumulative minimum value of each display point over many traces. Trace A is unaffected.

A-B->C
Subtracts the value of Trace B from Trace A and places the result in Trace C. This function is userful for observing the changes in value of live Trace A compared to a trace stored in Trace B. Display scaling can be set so that the difference is easy to see.

B-A->C
Subtracts the value of Trace A from Trace B and places the result in Trace C. This function is userful for observing the changes in value of live Trace A compared to a trace stored in Trace B. Display scaling can be set so that the difference is easy to see.

Save/Recall

Selecting this soft key opens a list of save and recall function soft keys, as explained in the **File** menu section on page .

Full Screen

Increases the size of the X-Y display by hiding the data labels on the left side of the display.

Chapter 4
Measurement Fundamentals

Introduction

Measurement fundamentals include the use of additional spectrum analyzer functions beyond frequency, span, amplitude and marker functions. In particular, this section focuses on resolution bandwidth, video bandwidth, sweep, and attenuator functions.

Resolution Bandwidth

Resolution Bandwidth is determined by the intermediate frequency (IF) filter bandwidth. The spectrum analyzer traces the shape of the IF filter as it tunes past a signal. If more than one IF filter is used in a spectrum analyzer, the narrowest one dominates and is considered the resolution bandwidth. The choice of resolution bandwidth depends on several factors. Filters take time to settle. That is, when a signal first appears at the input of the filter, it will take a while before the signal appears at the output. Additionally, 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 so the slower the sweep speed.

The choice of resolution bandwidth will depend on 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 on the type of measurement required by the user.

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 on 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. This is because the IF filter of the analyzer has been made narrower in bandwidth, which lets in less noise. As the measured noise level drops, smaller signals that were previously obscured by the noise can now be measured.

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. In the MS2717A Spectrum Analyzer, this ratio can be specified in the BW menu. For a resolution bandwidth of 30 kHz, the typical video bandwidth setting options are either 3 kHz or 300 Hz.

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 on 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.

Fortunately, the Anritsu Economy Spectrum Analyzer is 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 with Spectrum Analyzer, 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 **Shift** and **Sweep** keys, then selecting the Min Sweep Time soft key. Enter a sweep time from 0.02 ms to 4294 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 Spectrum Analyzer will never sweep faster than the RBW and VBW settings will allow. Spectrum Analyzer is designed to assure that no uncalibrated measurement conditions will occur.

Attenuator Functions

Attenuation adjusts the spectrum analyzer input attenuator. In Auto mode, as the reference level is increased, the attenuation is increased. In Manual mode, the input attenuation can be adjusted using the keypad or the Up/Down arrow keys. The attenuator range is 0 to 65 dB, in 5 dB steps. When the preamplifier is on, input attenuation can be either 0 dB or 10 dB.

Preamplifier Operation

The preamplifier can be turned on and off by pressing the **Amplitude** key, then selecting the Preamp On/Off soft key. The preamplifier has a gain of approximately 25 dB and generally will lower the noise floor by that amount. When the preamplifier is on, input attenuation can be either 0 dB or 10 dB.

Preamplifier Measurement Example

Figures 4-1 and 4-2 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.

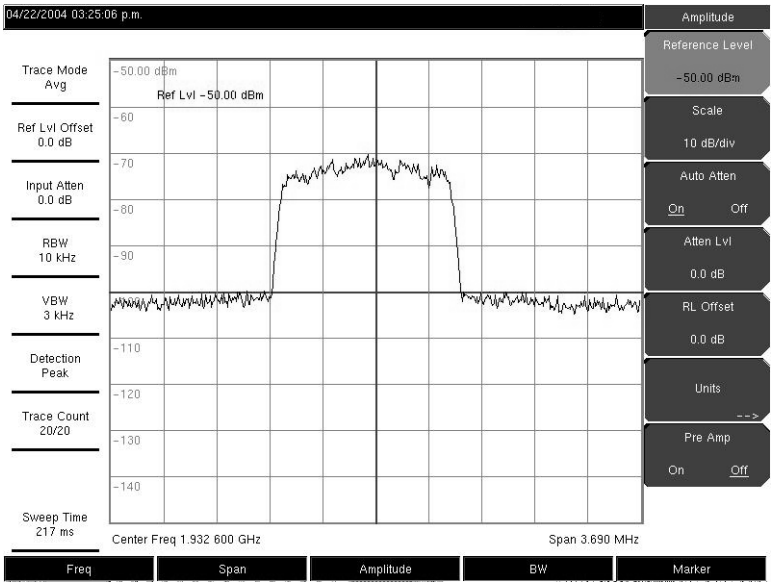

Figure 4-1. Preamplifier Off

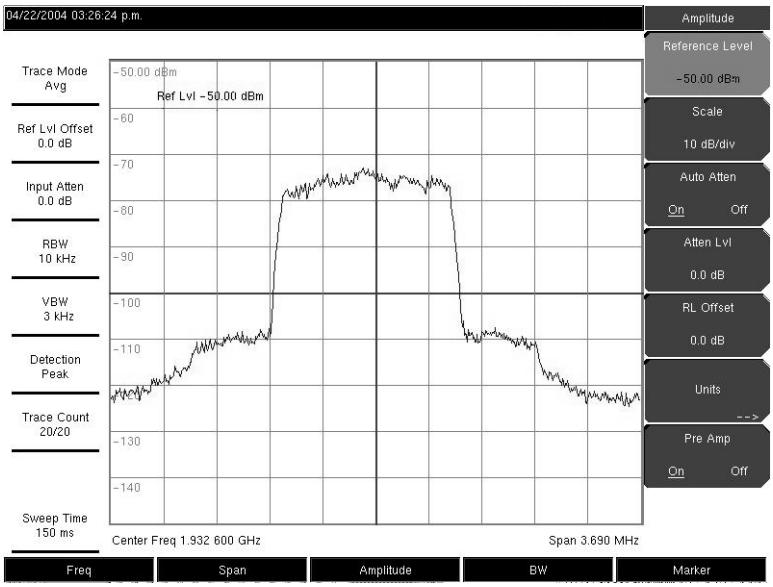

Figure 4-2. Preamplifier On

Chapter 5
Transmitter Measurements

Introduction

There are one-button measurements built into the MS2717A 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 chapter presents brief examples demonstrating the use of these measurements.

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 on the technique used to modulate the carrier.

% Down Method

The occupied frequency bandwidth is calculated as the bandwidth containing the specified percentage of the transmitted power.

dBc Down 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

- Anritsu MS2717A Economy Spectrum Analyzer
- 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

Step 1. Using the test port extension cable and the 30 dB, 50 watt, bi-directional attenuator (if needed) connect the MS2717A to the appropriate transmitter test port or signal source.

Step 2. Press the **Freq** key followed by the Center Freq soft key and enter the center frequency using the keypad , the arrow keys, or the rotary knob. If entering a frequency using the keypad, the soft key labels change to GHz, MHz, kHz and Hz. Select the appropriate units key. Selecting the **Enter** key has the same affect as the MHz soft key.

Step 3. If the attenuator was connected in Step 1, press the **Amplitude** key and select the RL Offset soft key and set the reference level offset to -30 dB to compensate for the loss in the attenuator.

Step 4. Press the **Amplitude** key then press the Reference Level soft key to set the appropriate reference level.

Step 5. Press the Atten Lvl soft key to set the input attenuation level or leave Auto Atten set to On.

Step 6. Press the **BW** key to set the resolution bandwidth and video bandwidth if desired.

Step 7. Press the **Shift** key then the **Measure** (4) key followed by the OCC BW soft key. Choose the measurement method (dBc Down or % Down) by pressing the Method soft key. The selected method is underlined.

Step 8. Press the dBc or % soft keys to adjust the settings as needed. Common values are 99% and 30 dBc.

Step 9. Press the On/Off soft key to start the measurement. An information box will appear below the graph while occupied bandwidth measurement is on.

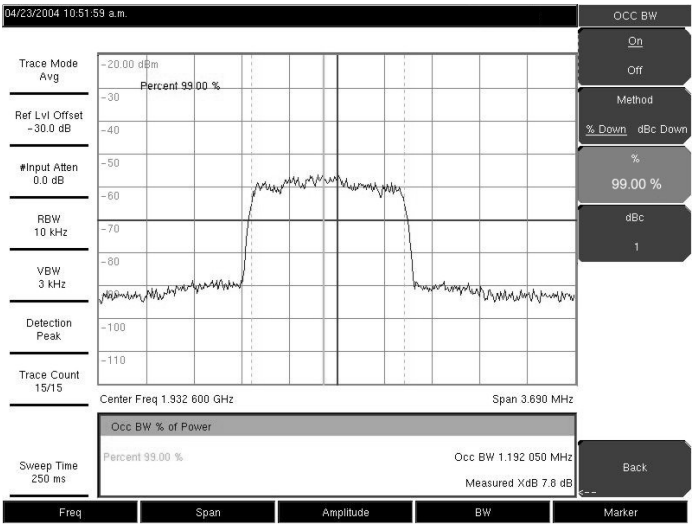

Figure 5-1. Occupied Bandwidth Results Using the % of Power Method

Figure 5-1 shows the occupied bandwidth results using the % of power method on a CDMA signal. Occupied Bandwidth is a constant measurement; once it is turned on, it remains on until it is turned off by pressing the On/Off soft key again. Occupied bandwidth is calculated at the end of each sweep.

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 automatically set by pressing the **Frequency** key and then the Signal Standard soft key. Choose the desired standard and press **Enter**. Press the Channel # soft key to enter the channel number at which the measurement is to take place.

CDMA Channel Power

The MS2717A can be used to measure CDMA signals in terms of channel power. It is important to use the proper settings to accurately measure a CDMA signal because a CDMA signal is different from a CW signal in many respects.

The following are the recommended settings for IS-95 CDMA measurements:

- CDMA Channel Bandwidth: 1.23 MHz
- Auto RBW setting: 10 kHz
- Auto VBW setting: 3 kHz

These values are set automatically when the appropriate signal standard is selected. Averaging may be used if desired.

CDMA Channel Power Measurement

Required Equipment

- MS2717A Economy Spectrum Analyzer
- 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)
- Test Port extension cable, Anritsu 15NNF50-1.5C

Procedure

Step 1. Using the test port extension cable and 30 dB attenuator (if needed), connect the signal source to the input of the attenuator, and connect the output of the attenuator to the RF In test port of the MS2717A.

Step 2. Press the **Freq** key followed by the Signal Standard soft key. Scroll through the dialog box using the rotary knob or Up/Down arrow keys to highlight the desired air interface standard. In this case, select CDMA US PCS - Downlink and press **Enter**.

Step 3. Press the Channel# soft key and enter the channel number using the keypad , the arrow keys, or the rotary knob. In this case, select channel 50.

Step 4. If the attenuator was connected in Step 1, press the RL Offset soft key and set the reference level offset to -30 dB to compensate for the loss of the attenuator.

Step 5. Press the **Amplitude** key and select the Reference Level soft key. Set the reference level to -50 dBm.

Step 6. Press the Scale soft key and set the scale to 10 dB/division.

Step 7. Press the **Shift** key then the **Measure** (4) key, and select the Channel Power soft key.

Step 8. Select the Center Freq soft key and verify that the center frequency of the Spectrum Analyzer is set to that of the CDMA signal, 1.9326 GHz in this example. This value is automatically set when the air interface standard and channel number are selected.

Step 9. Press the Int BW soft key and verify that the integration bandwidth is set to 1.23 MHz.

Step 10. Press the Span soft key and verify that the span is set to 3.69 MHz.

> NOTE: The integration bandwidth is defined as the frequency span in which the spectrum analyzer integrates measured power readings, while the channel span is the frequency range of the analyzer sweeps.

Step 11. Make the measurement by pressing the On/Off soft key. The MS2717A displays the measurement results in the message area.

> NOTE: Channel power is a constant measurement. Once it is turned on, it will remain on until it is turned off by pressing the On/Off key again.

GSM Channel Power Measurement

Global Systems for Mobile (GSM) communication is a globally accepted standard for digital cellular communication. There are three frequency bands allocated to GSM mobile phones, one at 850 MHz, one at 900 MHz, and another at 1800 MHz. GSM uses 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). Each channel has an uplink and a downlink, 80 MHz apart. GSM uses the Gaussian Minimum Shift Keying (GMSK) modulation method. Due to the nature of

TDMA, GSM transmitters ramp RF power rapidly. If the transmitter keys on too quickly, users on different frequencies (especially those close to the channel of interest) may experience significant interference. This is one of the reasons that spurious measurements are extensively used in GSM applications.

Required Equipment

- MS2717A Economy Spectrum Analyzer
- Test Port extension cable, Anritsu 15NNF50-1.5C

Procedure

Step 1. Using the test port extension cable, connect the signal source to the RF In test port of the MS2717A.

Step 2. Press the **Amplitude** key and select the Reference Level soft key to set the reference level to -20 dBm. Adjust the values given in this procedure to match your measurement conditions.

Step 3. Press the Scale soft key and set the scale to 10 dB/division.

Step 4. Press the **BW** key and verify that RBW Auto and VBW Auto are On.

Step 5. Press the **Freq** key followed by the Signal Standard soft key. Scroll through the dialog box using the rotary knob or Up/Down arrow keys to highlight the GSM900 standard for the measurement and press **Enter**.

Step 6. Press the Channel# soft key and enter the channel number using the keypad , the arrow keys, or the rotary knob. For this example, select Channel 60.

Step 7. Press the **Shift** key then the **Measure** (4) key and press the Channel Power soft key.

Step 8. Select the Center Freq soft key and verify that the center frequency of the Spectrum Analyzer is set to that of the GSM signal, in this case 947.0 MHz.

Step 9. Select the Int BW soft key and enter 200 kHz for the integration bandwidth, or set the integration bandwidth appropriate for the particular application.

Step 10. Select the Span soft key and enter 800 kHz as the channel span, or set the channel span to a value appropriate for the particular application.

Step 11. Make the measurement by pressing the Measure soft key. The MS2717A displays the measurement results in the message area.

NOTE: Channel Power is a constant measurement. Once it is turned on, it will remain on until it is turned off by pressing the On/Off soft key again.

AMPS Channel Power Measurement

The MS2717A can be used to test Advanced Mobile Phone System (AMPS) base stations. These systems are narrow-band FM voice transceivers with system control functionality. The energy of the AMPS signal is represented by multiple narrow band FM channels spread over a wide frequency range. AMPS frequency allocations are within the 800 and 900 MHz cellular telephone spectrum. Each service provider can use half of the 825-845 MHz range for receiving signals from cellular phones and half the 870-890 MHz range for transmitting to cellular phones. The bands are divided into 30 kHz channels with 12 kHz maximum frequency deviation.

Required Equipment

- MS2717A Economy Spectrum Analyzer
- Test Port extension cable, Anritsu 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

Step 1. Using the test port extension cable, and the 30 dB attenuator if needed, connect the signal source to the input of the attenuator, and connect the output of the attenuator to the RF In test port of the MS2717A.

Step 2. If the attenuator was connected in Step 1, press the **Amplitude** key and select the RL Offset soft key and set the reference level offset to -30 dB to compensate for the loss in the attenuator.

Step 3. Press the **Amplitude** key and select the Reference Level soft key to set the reference level to -50 dBm.

Step 4. Press the Scale soft key and set the scale to 10 dB/division.

Step 5. Press the **Amplitude** key followed by the Auto Atten soft key if needed to turn On auto attenuation.

Step 6. Press the **BW** key and verify that RBW Auto and VBW Auto are On.

Step 7. Press the **Shift** key then the **Trace** (5) key. Press the Trace Mode soft key as needed to select Max (maximum hold).

Step 8. Press the **Shift** key then the **Measure** (4) key and press the Channel Power soft key.

Step 9. Select the Center Freq soft key and set the center frequency of the Spectrum Analyzer to that of the signal, in this example 888.852728 MHz.

Step 10. Select the Int BW soft key and enter 30 kHz for the integration bandwidth.

Step 11. Select the Channel Span soft key and enter 90 kHz as the channel span, or set the channel span to a value appropriate for the particular application.

Step 12. Make the measurement by pressing the On/Off soft key.

NOTE: Channel Power is a constant measurement. Once it is turned on, it will remain on until it is turned off by pressing the On/Off soft key again.

Adjacent Channel Power Ratio

Another common transmitter measurement is that of Adjacent Channel Power Ratio (ACPR), or adjacent channel leakage power. This is defined as the ratio of the amount of leakage power in an adjacent channel to the total transmitted power in the main channel. This measurement can be used to replace the traditional two-tone intermodulation distortion (IMD) test for system non-linear behavior.

The result of an ACPR measurement is expressed as a power ratio. In order to calculate the upper and lower adjacent channel values, the MS2717A needs to know the values of four parameters:

- Main Channel Center Frequency
- Measurement Channel Bandwidth
- Adjacent Channel Bandwidth
- Channel Spacing

When a signal standard is selected from the list in the MS2717A, these four values are automatically set for that signal standard.

Adjacent Channel Power Measurement

Required Equipment

- MS2717A Economy Spectrum Analyzer
- 30 dB, 50 watt, Bi-Directional, DC - 18 GHz, N(m) - N(f), Attenuator, Anritsu 42N50A-30 (if needed for the power level being measured)
- Test Port extension cable, Anritsu 15NNF50-1.5C

Procedure

Step 1. Using the test port extension cable, and the 30 dB attenuator if needed, connect the signal source to the input of the attenuator, and connect the output of the attenuator to the RF In test port of the MS2717A.

Step 2. If the attenuator was connected in Step 1, press the **Amplitude** key and select the RL Offset soft key and set the reference level offset to -30 dB to compensate for the loss of the attenuator.

Step 3. Press the **Amplitude** key and select the Reference Level soft key to set the reference level to the appropriate reference level.

Step 4. Press the Atten Lvl soft 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.

Step 5. Press the **BW** key and verify that RBW Auto and VBW Auto are On.

Step 6. There are two ways to set the measurement parameters. If the signal standard and channel are known, press the **Freq** key and set the Signal Standard and Select Channel soft keys for the signal to be measured then skip to Step 12. If the signal standard and channel are not known, follow the procedure in Steps 6 through 11 below.

Step 7. Press the **Freq** key, select the Center Freq soft key, and enter the desired center frequency.

Step 8. Press the **Shift** key then the **Measure** key and press the ACPR soft key.

Step 9. Press the Main Ch BW soft key, and enter the desired main channel bandwidth. For an IS-95 CDMA signal, enter 1.23 MHz.

Step 10. Press the Adj Ch BW soft key, and enter the desired adjacent channel bandwidth. For an IS-95 CDMA signal, enter 1.23 MHz.

Step 11. Press the Ch Spacing soft key, and enter the desired channel spacing. For an IS-95 CDMA signal, enter 1.23 MHz.

Step 12. Begin making measurement by pressing the On/Off soft key. The MS2717A displays the measurement results in the message area.

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

GSM Adjacent Channel Power Measurement

Required Equipment

- MS2717A Economy Spectrum Analyzer
- 30 dB, 50 watt, Bi-Directional, DC - 18 GHz, N(m) - N(f), Attenuator, Anritsu 42N50A-30 (if required for the power level being measured)
- Test Port extension cable, Anritsu 15NNF50-1.5C

Procedure

Step 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 of the MS2717A.

Step 2. If the attenuator was connected in Step 1, press the RL Offset soft key and set the reference level offset to -30 dB to compensate for the loss of the attenuator.

Step 3. Press the **Amplitude** key and select the Reference Level soft key to set the reference level to 60 dBm.

Step 4. Press the Atten Lvl soft 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.

Step 5. Press the **BW** key and verify that RBW Auto and VBW Auto are On.

Step 6. There are two ways to set the measurement parameters. If the signal standard and channel are known, press the **Freq** key and set the Signal Standard and Select Channel soft keys for the signal to be measured then skip to Step 12. If the signal standard and channel are not known, follow the procedure in Steps 7 through 12 below.

Step 7. Press the **Freq** key, select the Center Freq soft key, and enter the desired center frequency.

Step 8. Press the **Shift** key then the **Measure** key and select the ACPR soft key.

Step 9. Select the Main Ch BW soft key, and enter the main channel bandwidth.

Step 10. Select the Adj Ch BW soft key, and enter the adjacent channel bandwidth.

Step 11. Select the Ch Spacing soft key, and enter the channel spacing.

Step 12. Make the measurement by pressing the On/Off soft 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 MS2717A will display the measurement results in the message area.

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

AMPS (TDMA) Adjacent Channel Power Measurement

Required Equipment

- MS2717A Economy Spectrum Analyzer
- 30 dB, 50 watt, Bi-Directional, DC - 18 GHz, N(m) - N(f), Attenuator, Anritsu 42N50A-30 (if needed for the power level being measured)
- Test Port extension cable, Anritsu 15NNF50-1.5C

Procedure

Step 1. Using the test port extension cable, and the 30 dB attenuator if needed, connect the signal source to the input of the attenuator, and connect the output of the attenuator to the RF In test port of the MS2717A.

Step 2. If the attenuator was connected in Step 1, press the **Amplitude** key and select the RL Offset soft key and set the reference level offset to -30 dB to compensate for the loss in the attenuator.

Step 3. Press the **Amplitude** key and select the Reference Level soft key to set the reference level to -50 dBm.

Step 4. Press the RL Offset soft key to set the reference level offset to -30 dB.

Step 5. Press the Auto Atten soft key and set automatic attenuation to On.

Step 6. Press the **Freq** key, select the Center Freq soft key, and enter 835 MHz.

Step 7. Press the **Shift** key then the **Measure** key and press the ACPR soft key.

Step 8. Press the Main Ch BW soft key to enter the main channel bandwidth. For an AMPS signal, enter 30 kHz.

Step 9. Press the Adj Ch BW soft key, and enter the adjacent channel bandwidth. For an AMPS signal, enter 30 kHz.

Step 10. Select the Ch Spacing soft key, and enter the channel spacing. For an AMPS signal, enter 30 kHz.

Step 11. Make the measurement by pressing the On/Off soft 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 MS2717A will display the measurement results in the message area.

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

Out-of-Band Spurious Emission Measurement

Required Equipment

- MS2717A Economy Spectrum Analyzer
- Test Port extension cable, Anritsu 15NNF50-1.5C

Procedure

Step 1. Using the test port extension cable, connect the signal source to the RF In test port of the MS2717A.

Step 2. Press the **Freq** key, select the Center Freq soft key, and enter the center frequency.

Step 3. Press the **Span** key. Set the span wide enough to include the primary channel bandwidth and upper and lower channel bandwidths.

Step 4. Press the **Amplitude** key, then press the Reference Level soft key and set the reference level to -20 dBm.

Step 5. Press the Auto Atten soft key set the attenuation to On.

Step 6. Press the **BW** key and use the RBW and VBW soft keys to set the resolution bandwidth to 3 kHz and the video bandwidth to 300 Hz.

Step 7. Press the **Marker** key and press the Marker 1 2 3 4 5 6 soft key to select marker 1. The underlined number indicates the active marker.

Step 8. Press the On/Off soft key and use the arrow keys, the keypad and the knob to move the marker over one of the spurs.

Step 9. Compare the value of the marker to the specified allowable level of out-of-band spurious emissions for the corresponding channel transmit frequency.

Step 10. Repeat Steps 9 and 10 for the remaining spurs. Use either Marker 1 again, or choose another marker. Figure 5-2 shows a simulated out-of-band spurious signal 21.000 MHz from the carrier using a delta marker.

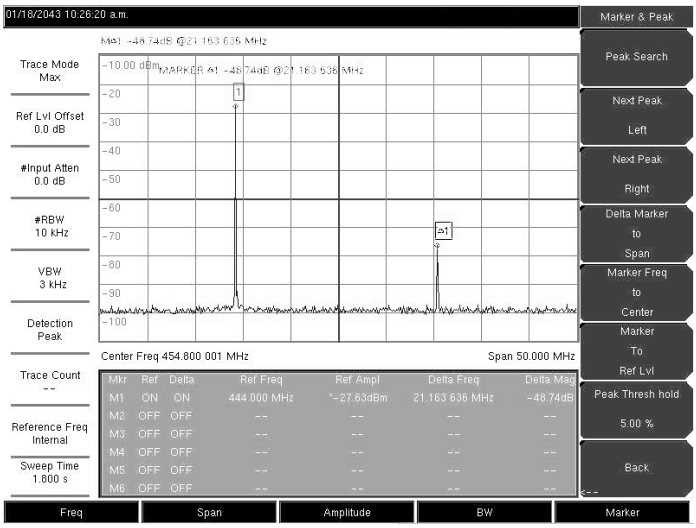

Figure 5-2. Simulated Out-of-Band Spurious Emission Measurement

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

In-band Spurious Measurement

Required Equipment

- MS2717A Economy Spectrum Analyzer
- 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

Step 1. Using the test port extension cable and 30 dB, 50 watt, Bi-directional attenuator, connect the MS2717A to appropriate transmit test port.

Step 2. Press the **Freq** key, select the Center Freq soft key, and enter the center frequency.

Step 3. Press the **Span** key. Set the span wide enough to include the primary channel bandwidth and upper and lower channel bandwidths.

Step 4. Press the **Amplitude** key and then press the Reference Level soft key to set the reference level to -20 dBm.

Step 5. Select the RL Offset soft key to set the reference level offset to -30 dB to compensate for the loss of the attenuator

Step 6. Press the Auto Atten soft key set the attenuation to On.

Step 7. Press the **BW** key and use the RBW and VBW soft keys to set the resolution bandwidth to 10 kHz and the video bandwidth to 300 Hz.

Step 8. Press the **Marker** key and press the Marker 1 2 3 4 5 6 soft key to select marker 1. The underlined number indicates the active marker.

Step 9. Press the On/Off soft key and use the arrow keys, the keypad and the knob to move the marker over one of the spurs.

Step 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.

Step 11. Repeat steps 9 and 10 for the remaining spurs. Use either Marker 1 again, or choose another marker.

Figure 5-3 shows a simulated in-band spur at 1.625 MHz from the carrier frequency. The carrier is measured by M1. The delta marker on M1 shows the signal at fc+ 1.625 MHz to be 60.17 dB down from the carrier. These values should be compared against the specification for the transmitter being tested.

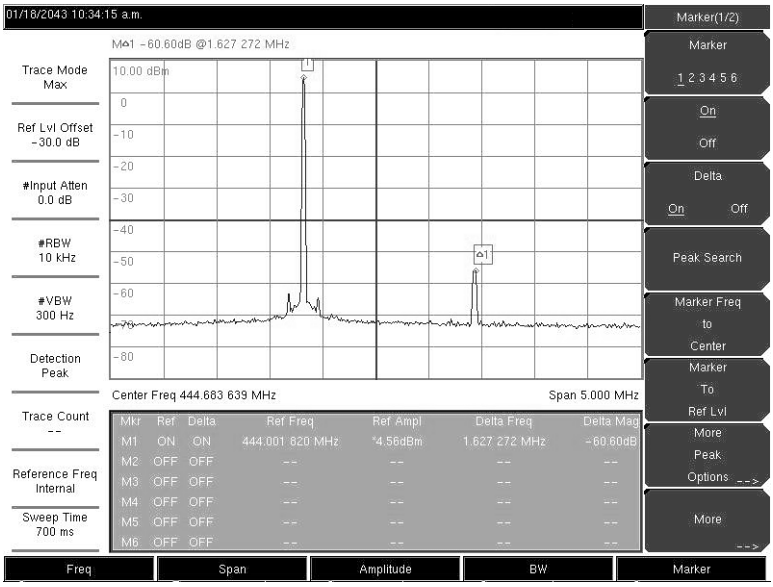

Figure 5-3. In-band Spurious Measurement

NOTE: The resolution bandwidth of a spectrum analyzer is determined by the intermediate frequency (IF) filter bandwidth. The MS2717A traces the shape of the IF filter as it sweeps past a signal. Therefore, if two equal-amplitude signals are very close to each other, the measurement result can appear to be one single response because the IF or resolution bandwidth is not small enough to resolve the two signals. Similarly, if two signals are not equal in amplitude but are very close together, the smaller signal may not be seen because it is hidden under the large response.

Field Strength

Required Equipment

- MS2717A Economy Spectrum Analyzer
- Portable Antenna for which antenna factors or antenna gain and bandwidth data are available.

Procedure

Step 1. Press the **Shift** key then the **Measure** key and press the Field Strength soft key.

Step 2. Press the Antenna soft key and use the Up/Down arrow keys or the rotary knob to select the desired antenna. Press the **Enter** key to select.

> NOTE: Select an antenna from the standard list available in the MS2717A, or use the Antenna Editor feature of Anritsu Master Software Tools (see Chapter 6) to define a custom antenna and upload the antenna information to the MS2717A antenna list.

Step 3. Connect the antenna to the MS2717A.

Step 4. Press the **Freq** key, select the Center Freq soft key, and enter the center frequency.

Step 5. Press the **Span** key. Set the span wide enough to include the primary channel bandwidth and upper and lower channel bandwidths.

Step 6. Press the **BW** key and verify that RBW Auto and VBW Auto are On.

Step 7. To change the units of measurement, press the **Amplitude** hard key, then press the Units soft key and select dBm, dBV, dBmV or dBµV.

Step 8. Select either the Volts or Watts soft key, as required. The MS2717A automatically adjusts the measurement by the antenna factors selected. Marker values will be displayed in the same units as selected for the amplitude.

Antenna Calculations

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

Conversion of signal levels from W to V in a 50 ohm system:

$$P=V^2/R$$

where:

P = power in Watts
V = voltage level in Volts
R = resistance in Ohms

Note that 1 mW = 10^{-3} W and 1µV = 10^{-6}V.

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

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

Power density to field strength. An alternate measure of field strength to electric field is power density:

$$Pd=E^2/120p$$

where:

E = field strength in V/m
P = Power density in W/m

Power density at a point:

$P_d=P_tG_t/(4\ pr^2)$

In the far field, where electric and magnetic fields are related by the 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

AM/FM/SSB Demodulation

The MS2717A built-in demodulator for AM, narrowband FM, wideband FM and single sideband (selectable USB and LSB) allows a technician to hear an interfering signal to ease identification. The demodulated signal can be heard using either the built-in speaker, or through a monaural cellular headset connected to the 2.5-mm jack on the test panel.

Demodulation Procedure

Step 1. Press the **Shift** key followed by the **Measure** (4) key and the AM/FM Demod soft key.
Step 2. Press the Demod Type soft key and select FM Wide Band, FM Narrow Band, AM, USB, or LSB to match the modulation format of the signal.
Step 3. Press the Back soft key.
Step 4. Press the Demod Freq soft 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 soft key allows adjustment of the beat frequency oscillator to fine tune the signal through a span of ±10000 Hz.
Step 5. Press the On/Off soft key to enable the measurement.
Step 6. Press the Volume soft key and use the Up/Down arrow keys or rotary knob to change the audio volume from 0% to 100%. For most cellular headsets a volume of 40% is adequate.
Step 7. The Demod Time soft key sets the time the Spectrum Analyzer will demodulate the signal. Enter a value from 100 ms to 500 seconds.

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

Step 1. Press the **Frequency** key followed by the Signal Standard soft key. Select the appropriate signal standard based on the signal to be measured and press **Enter**.
Step 2. Press the Select Channel soft key, select the operating channel of the access point being measured and press **Enter**.
Step 3. Press the **Shift** key followed by the **Measure** (4) key and the C/I soft key.

Step 4. Press the Center Freq soft key and enter the desired frequency, unless a Signal Standard and Channel have already been selected in the **Frequency** menu.

Step 5. If needed, press the Span soft key and set an appropriate span width for the signal to be measured.

Step 6. If the signal environment includes slow frequency hopping signals, such as cordless telephones, press the Min Sweep Time soft key to set a sweep time of one second or more to give a good chance of capturing instances of the interfering signal.

Step 7. Press the On/Off soft 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.

Step 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.

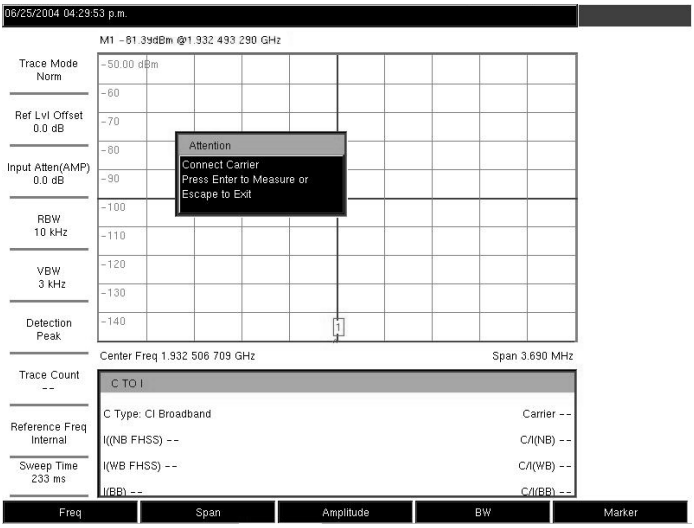

Figure 5-4. C/I Measurement, Ready to Measure the Carrier

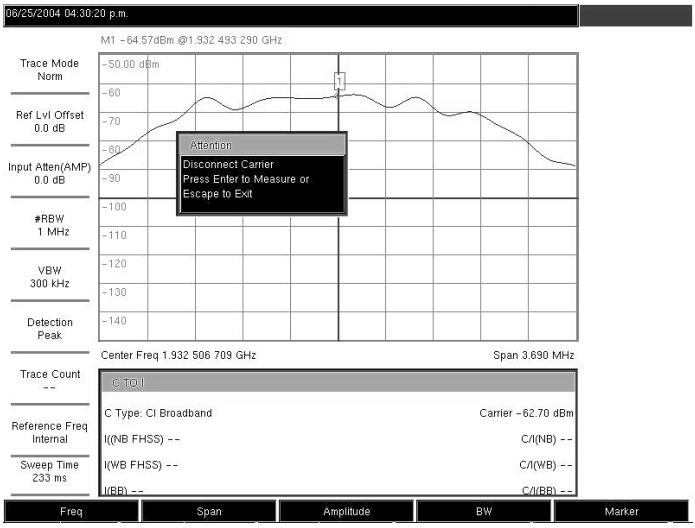

Figure 5-5. C/I Measurement, Carrier Measured

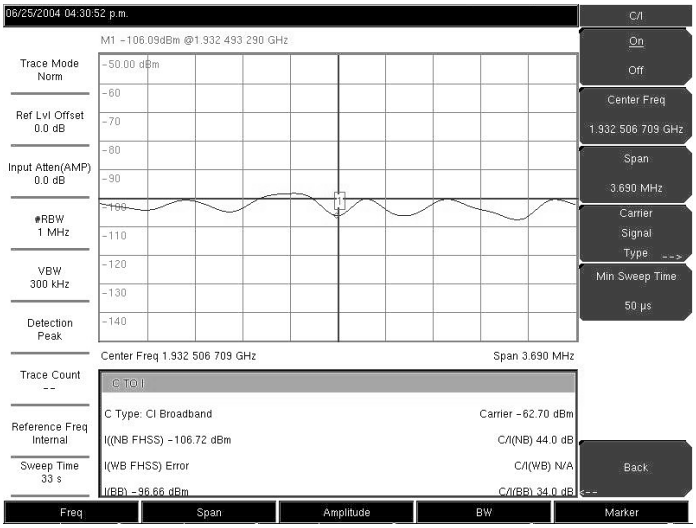

Figure 5-6. C/I Measurement, Results

Chapter 6
WCDMA/HSDPA Measurements

Introduction

The MS2717A offers WCDMA/HSDPA RF Measurements (Option 44), and WCDMA Demodulator Measurements (Option 45). This chapter explains the use of these options.

NOTE: The WCDMA Demodulator demodulates only WCDMA signals.

To connect the node B equipment directly to the MS2717A, connect the power amplifier of the node B equipment to the RF In connector of the MS2717A using a coupler or attenuator.

NOTE: The maximum input damage level of the RF In port is +43 dBm. To prevent damage always use a coupler or high power attenuator.

WCDMA/HSDPA Signal Analyzer Mode

Amplitude

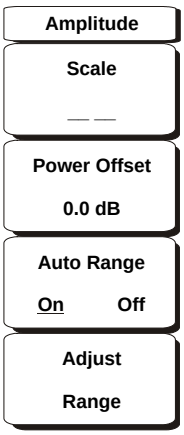

Figure 6-1. WCDMA/HSDPA Amplitude Menu

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 Up/Down arrow keys.

Power Offset

Choose power offset to have the Spectrum Analyzer automatically adjust for the loss through any external cables, attenuators and couplers. The power can be offset from 0-100 dB. Press the Power Offset key, enter the values and press the dB softkey.

Auto Range On/Off

Adjusts the reference level automatically when Auto Range is activated. Toggles between On and Off.

Adjust Range

Adjust the range adjusts the reference level to be optimal based on the measured signal.

File

To access the functions under the File menu, select the **Shift** key, then the **File** (7) key.

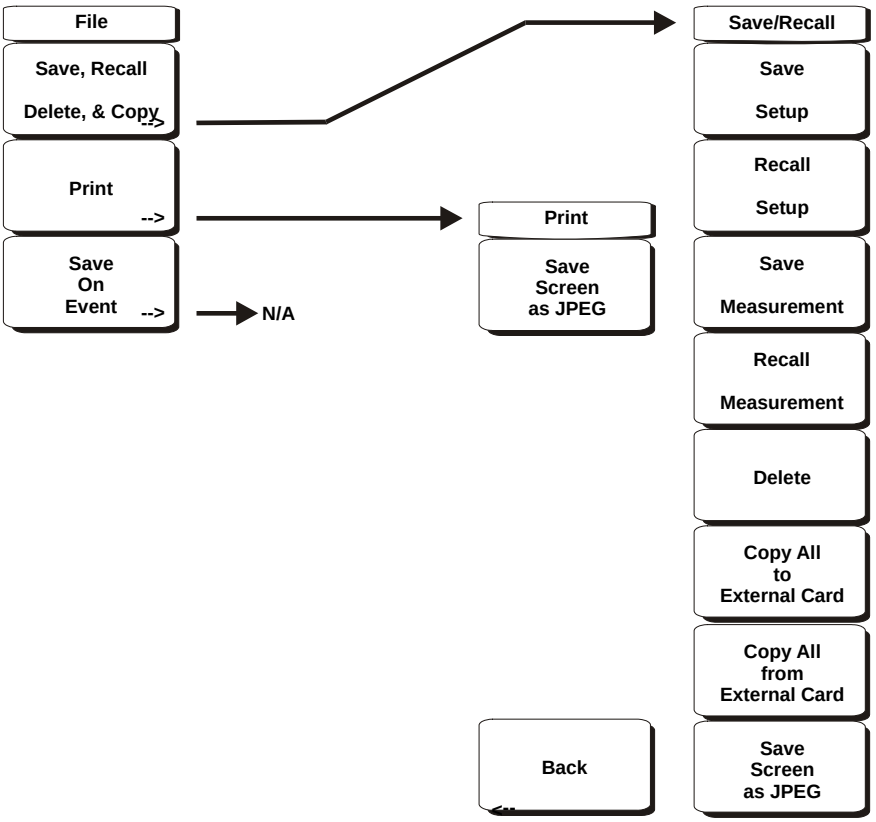

Figure 6-2. WCDMA/HSDPA File Menu

Save / Recall

Selecting this soft key opens a list of save and recall function soft keys, as explained below. Press the **Back** key to return to the **File** menu.

Save Setup

Opens a dialog box to name and save the current operating settings, allowing them to be recalled later to return the instrument to the state it was in at the time the setup was saved. The saved setup can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/ Right directional arrows to move the cursor position. Press **Enter** to save the setup.

Recall Setup

This soft key brings up a selection box that allows selection and recall of a previously stored instrument setup. Use the rotary knob or the Up/Down arrow keys to highlight

the saved setup, and press **Enter**, the rotary knob, or the Recall soft key to select. All current instrument settings are replaced by the stored setup information. Press the **Esc** key to cancel the recall.

Save Measurement

Initiates a dialog box to name and save the current active trace A. The saved measurement trace can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter.

Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the measurement trace. WCDMA measurements are saved with a .wcd extension.

NOTE: If a measurement has been previously saved, the Save Measurement dialog box will open with the previously saved name displayed with an automatically incremented suffix. For instance, if the previously saved trace was named Trace, the next measurement saved will be named Trace (1), and so on. To save the new measurement with this name, simply press **Enter**. To save the new measurement with a similar name, press the Right directional arrow and add the changes. To create a completly new name, use the keypad, the rotary knob or select the soft key for each letter.

Recall Measurement

Brings up a selection box that allows recall of a previously stored measurement trace. Use the rotary knob or the Up/Down arrow keys to highlight the saved measurement trace, and press **Enter**, the rotary knob, or the Recall soft key to select. A recalled trace may be displayed as trace A, in place of the live trace, or as trace B or C along with the live trace. Use the rotary knob or the Up/Down arrow keys to highlight the recalled trace option, and press the **Enter** key to select. Press the **Esc** key to cancel the recall.

To remove a recalled measurement trace from the screen, select the **Shift** key and the **Trace** (5) key to open the Trace menu. Use the Trace soft key to select the trace to be removed from the screen and use the View/Blank soft key to view or blank the trace. Use the Trace key to select an active trace after blanking a recalled trace.

Delete

Brings up a selection box that shows all stored setups and traces. The list shows the setup or trace name, the type (stp for a saved setup, spa for a saved trace, jpg for a JPEG file) and the date and time the information was saved. Use the rotary knob or the Up/Down arrow keys to highlight the saved information, and press **Enter**, the rotary knob, or the Delete soft key to delete. Press the Delete All soft key to delete all saved information. Press the **Esc** key to cancel the operation.

Copy All to External Card

This function copies all stored setups and measurements from the internal memory to an external Compact Flash memory card.

Copy All from External Card

This function copies all measurements and setups from an external Compact Flash memory card into the instrument internal memory.

Save Screen as JPEG

This function saves a measurement trace as a graphics file. Screens saved as JPG cannot be recalled from within the unit, but Master Software Tools can extract them for saving on a PC for printing or inserting into other documents. The saved measurement can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each

letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the measurement after entering the file name. The file is saved in the internal memory with the specified name, with .jpg appended.

Print

The Print key can be used to save a measurement trace as a graphics file. This file can then be downloaded to a PC using Master Software Tools and printed.

Save Screen as JPEG

This function saves a measurement trace as a graphics file. The saved measurement can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the measurement after entering the file name. The file is saved in the internal memory with the specified name, with .jpg appended.

Save On Event

Not applicable in WCDMA/HSDPA Signal Analyzer Mode (Option 44).

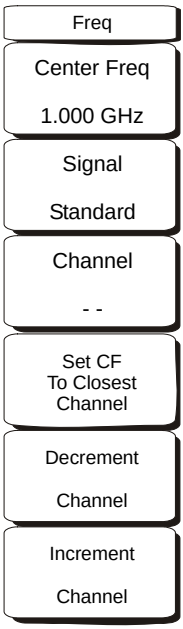

Figure 6-3. WCDMA/HSDPA Freq Menu

Center Freq

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

Signal Standard

Use the Up/Down arrow keys or the rotary knob to highlight a signal standard and press **Enter** to select. When a signal standard is selected, the center frequency and span for the first channel of the selected standard is automatically tuned. Other settings, such as channel spacing and integration bandwidth, are also automatically entered. Appendix A contains a table of the signal standards that are in the instrument firmware.

Channel

Use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is automatically tuned to the center frequency of the selected WCDMA channel.

Set CF To Closest Channel

Press the soft key to change the center frequency to the closest channel.

Decrement Channel

Use the Up/Down arrow keys or the rotary knob to decrease the channel number one channel.

Increment Channel

Use the Up/Down arrow keys or the rotary knob to increase the channel number one channel.

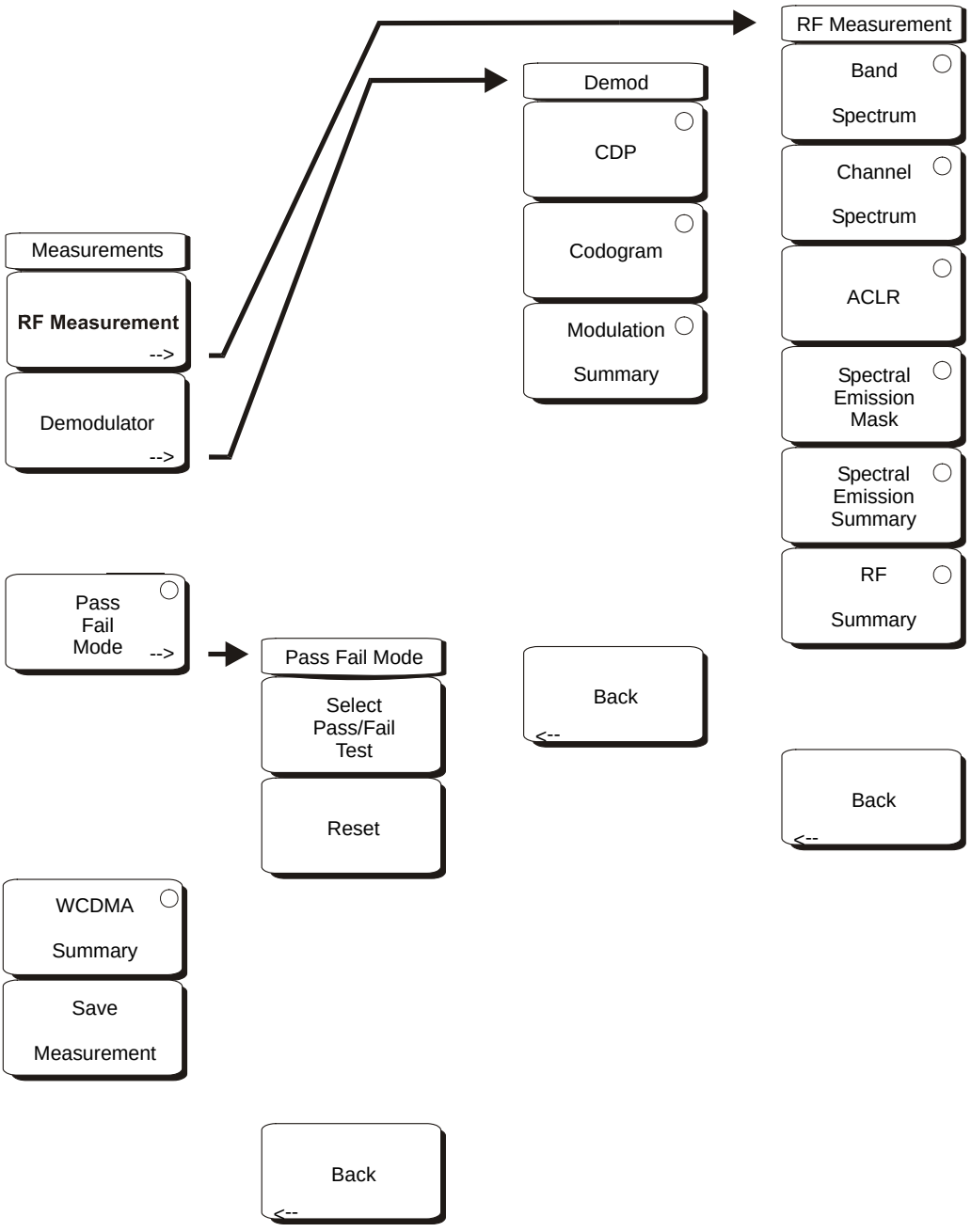

Figure 6-4. WCDMA Measurements Menu

RF Measurement

Opens the RF measurement menu.

Band Spectrum

Displays the spectrum of the selected band.

Ref Level
Sets the required reference level.

Scale
Change the scale.

Band Channel
Use the cursor to select the required channel and the unit analyzes the selected channel signal.

Previous Band
The unit automatically selects the previous band.

Next Band
The unit automatically selects the next band.

Back
Returns to the previous menu.

Channel Spectrum
Displays the spectrum of the selected channel. The screen also displays Channel Power in dBm and watts, Peak to Average power and Occupied Bandwidth.

ACLR
Displays the Adjacent Channel Leakage Ratio (ACLR). The user can set the main channels and adjacent channels from 1-4 channels. This screen can display up to 12 channels total.

Display Trace
Select ON to display the trace.

Select # of Main Channels
Set the main channels from 1-4 channels.

Select # of Adjacent Channels
Set the adjacent channels from 1-4 channels.

Back
Returns to the previous menu.

Spectral Emission Mask
Displays the received signal and the mask based on received signal strength.

Spectral Emission Summary
Displays the spectral emission mask in table format and whether the received signal passed in each frequency range.

RF Summary
Displays the RF measurements in table form.

Back
Returns to the previous menu.

Demodulator
Spectrum Analyzer in demodulator mode demodulates the received WCDMA signal. The demodulator has three displays, CDP, Codogram and Modulation Summary.

CDP

When Code Domain Power (CDP) is selected the screen displays all the selected OVSF codes and selected OVSF zoom codes in the graphical format. The display also displays P-CPICH Abs power, EVM, Carrier Frequency, Channel Power, Carrier Feedthrough, Frequency Error in Hz and PPM, Noise Floor and Peak CD Error. The screen also displays CPICH, P-CCPCH, S-CCPCH, PICH, P-SCH and S-SCH powers in the table format. If the marker is set on the code, the marker will display the code number, power and Symbol EVM.

Zoom

Select a zoom function of 32, 64 or 128 codes.

Zoom Start

Enter the required zoom start code. For example, to start at code 2, enter 2.

NOTE: For the WCDMA/HSDPA demodulator option, the CDP screen displays HSDPA and WCDMA signals. P-CPICH Abs power, EVM, Carrier Frequency, Channel Power, Carrier Feedthrough, Frequency Error in Hz and PPM, Noise Floor and Peak CD Error are also displayed. The screen displays CPICH, P-CCPCH, S-CCPCH, PICH, P-SCH and S-SCH powers in the table format. If the marker is set on the code, the marker will display the code number, power and Symbol EVM.

Codogram

When Codogram is selected the screen displays the changes in code power levels over time. Two graphs are displayed on the screen, the top one displays all the selected OVSF codes and the bottom one displays the selected OVSF zoom codes.

Zoom

Select a zoom function of 32, 64 or 128 codes.

Zoom Start

Enter the required zoom start code. For example, to start at code 2, enter 2.

Total Time

Use the keypad, the Up/Down arrow keys, or the rotary knob to enter the total time to display the changes in code power levels. The maximum total time for Codogram is 72 hours.

Single Sweep Time

Single sweep time is related to total time. Use the keypad, the Up/Down arrow keys, or the rotary knob to set the single sweep time.

Modulation Summary

Displays the demodulation parameters in the table format.

Back

Returns to the previous menu.

Pass/Fail Mode

The Spectrum Analyzer saves the five test model conditions specified in the 3GPP specification to test the base station. After the selected test model, the unit displays whether the base station passed or failed the test. Using Master Software Tools, a custom test list can be created and downloaded into the unit. All critical measurements can be selected for pass fail testing including each individual code power, spreading factor and symbol EVM. The results are displayed in table format with clear identification of pass/fail results including min/max thresholds and measured results.

Select Pass/Fail Test
Select the parameters file from the list.

Reset
Restart the measurement.

Back
Returns to the previous menu

WCDMA Summary
Displays the critical WCDMA measurements in a table format.

Save Measurement
Initiates a dialog box to name and save the current measurement. The saved measurement can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the measurement WCDMA measurements are saved with a .wcd extension.

NOTE: If a measurement has been previously saved, the Save Measurement dialog box will open with the previously saved name displayed. To save the new measurement with a similar name (for example, Trace-1, Trace-2, etc.) simply press the Right directional arrow and add the changes. To create a completely new name, use the keypad, the rotary knob or select the soft key for each letter.

Mode

To access the functions under the Mode menu, select the **Shift** key, then the **Mode** (9) key. The available modes will vary depending upon the options installed. Use the directional arrow keys or the rotary knob to highlight the selection and press the **Enter** key to select.

Preset

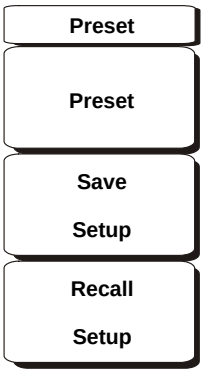

Figure 6-5. WCDMA/HSDPA Preset Menu

To access the functions under the Preset menu, select the **Shift** key, then the **Preset** (1) key.

Preset
This key resets the instrument to the default starting conditions of full band sweep, 10 dBm log reference level, 10 dB/division scaling, 0 dB reference level offset, all measurements turned off and trigger set to free run.

Save Setup

Opens a dialog box to name and save the current operating settings, allowing them to be recalled later to return the instrument to the state it was in at the time the setup was saved. The saved setup can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the setup.

Recall Setup

This soft key brings up a selection box that allows selection and recall of a previously stored instrument setup. Use the rotary knob or the Up/Down arrow keys to highlight the saved setup, and press **Enter**, the rotary knob, or the Recall soft key to select. All current instrument settings are replaced by the stored setup information. Press the **Esc** key to cancel the recall.

Setup

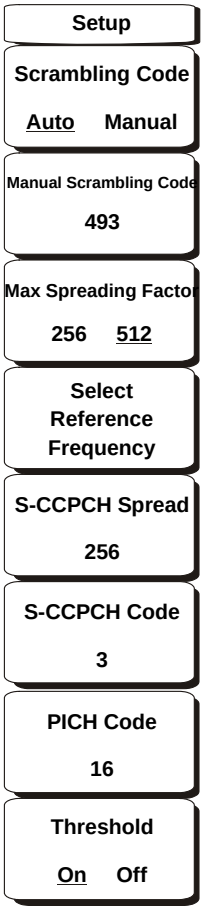

Figure 6-6. WCDMA/HSDPA Setup Menu

Auto Scrambling

Press the Auto Scrambling soft key to automatically select the scrambling code. This key toggles Auto Scrambling On or Off.

Scrambling Code

Press the Scrambling Code soft key to manually enter the scrambling code using the number keys or the rotary knob.

Max Spreading Factor

Press the Max spreading factor to toggle between 256 and 512 codes.

Select Reference Frequency

Press Select reference frequency and select from the displayed list using Up/Down arrow keys or rotary knob and press enter.

S-CCPCH Spread

Press S-CCPCH Secondary Common Control Physical Channel soft key to enable the S-CCPCH spreading factor and enter the desired code. The default value is 256.

S-CCPCH Code

Press S-CCPCH code to enable and enter the S-CCPCH code. The default value is 3.

PICH Code

Press PICH to activate Paging Indicator Channel and enter the desired code. The default value is 16.

Threshold

Change the measurement threshold by pressing threshold softkey and entering a desired value and pressing enter softkey. The default value is -30 dB.

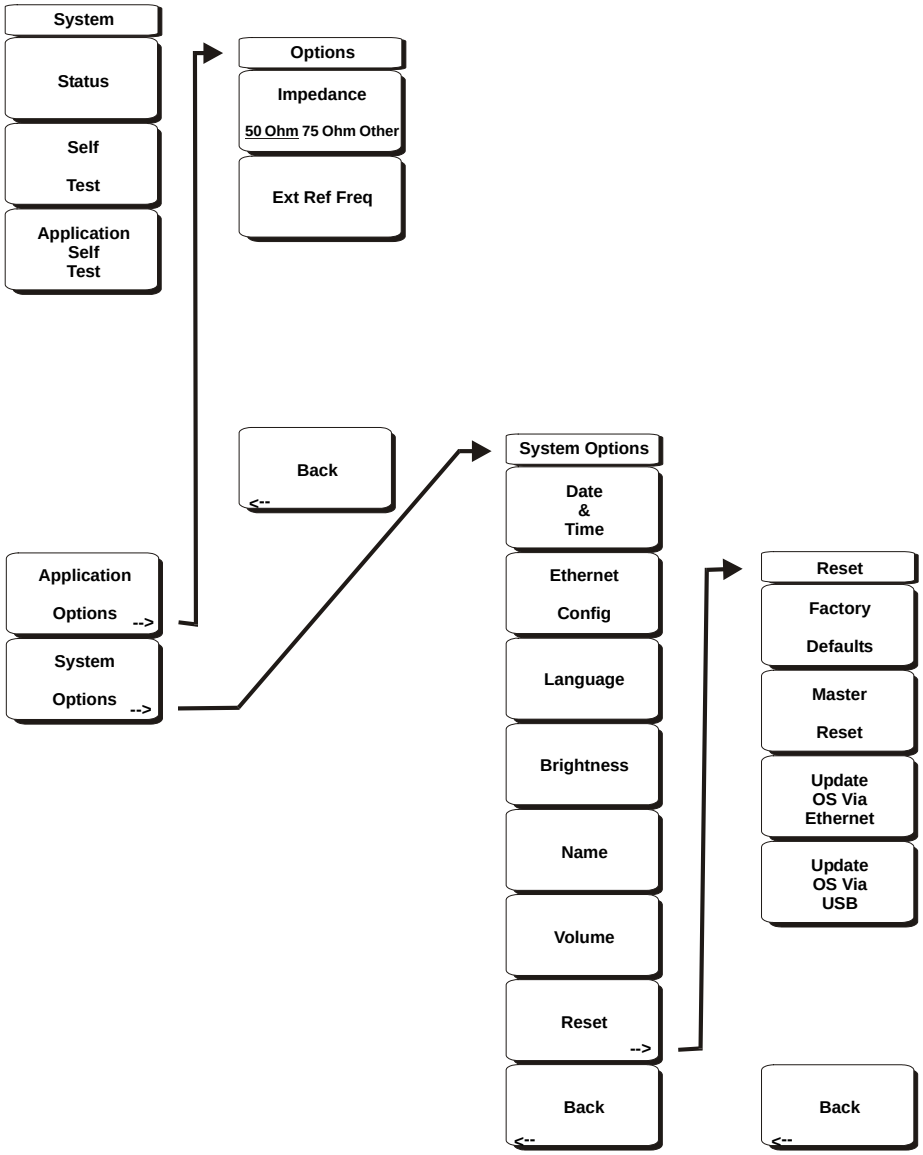

Figure 6-7. WCDMA/HSDPA System Menu

To access the functions under the System menu, select the **Shift** key, then the **System** (8) key.

Status

Pressing this soft key displays the current system status, including the operating system and firmware versions, temperatures and other details such as current battery information. Press **Esc** or **Enter** to return to normal operation.

Self Test

This soft key initiates a series of diagnostic tests that test the components of the instrument. A display will list the individual tests with a pass or fail indication. Press **Esc** or **Enter** to return to normal operation.

Application Self Test

This soft key initiates a series of diagnostic tests related to the performance of the MS2717A in WCMDA mode. A display will list the individual tests with a pass or fail indication. Press **Esc** or **Enter** to return to normal operation.

Application Options

This soft key presents a menu to select application options.

Select Reference Frequency

This soft key brings up a dialog box for selecting the Reference Frequency. Use the rotary knob or the Up/Down arrow keys to highlight the Reference Frequency and press **Enter** to select, or press the **Esc** key to cancel.

Back

Returns to the previous menu.

System Options

This key opens a selection of system option soft keys.

Date and Time

This soft key brings up a dialog box for setting the current date and time. Use the soft keys or the Left/Right arrow keys to select the field to be modified. Use the keypad, the Up/Down arrow keys or the rotary knob to select the date and time. Select **Enter** to accept the changes, or press the **Esc** key to return to normal operation without changing anything.

Ethernet Configuration

This soft key brings up a dialog box to set the IP address of the instrument.

Type Manual/DHCP

This softkey selects whether the address will be entered manually, or supplied automatically by a network DHCP server. If Manual is selected, use the soft keys or the Left/Right arrow keys to select the field to be modified. Use the keypad, the Up/Down arrow keys or the rotary knob to enter the input. Select **Enter** to accept the changes, or press the **Esc** key to return to normal operation without changing anything.

Language

This soft key brings up a selection box allowing selection from a list of built-in languages for the MS2717A displays. The languages currently available are English, French, German, Spanish, Japanese, Chinese, Korean, and Italian.

In addition, a custom language may be selected if it has been defined using the Master Software Tools software and loaded into the MS2717A. Two custom languages may be loaded into the instrument using Master Software Tools. Select **Enter** to accept the change, or press the **Esc** key to return to normal operation without changing anything.

Brightness

The brightness of the display can be adjusted to optimize viewing under a wide variety of lighting conditions. Use the keypad, the Up/Down arrow keys or the rotary knob to select a brightness level from 1 to 9, 9 being the brightest. Select **Enter** to accept the change.

Name

Opens a dialog box to name the instrument. The unit can be named using the keypad to select numbers, the rotary knob to highlight a number or character and pressing the knob to select, or by selecting the soft key for each letter. Use the **Shift** key to select an upper case letter. Use the Left/Right directional arrows to move the cursor position. Press **Enter** to save the name.

Volume

The current volume setting is displayed on the screen. Use the keypad, the Up/Down arrow keys or the rotary knob to change the volume and press the **Enter** key to accept the change.

Reset

Opens a menu of reset and update options.

Factory Defaults

Restores the instrument to the factory default values, including Ethernet, language and brightness settings. Press the **Enter** key to initiate the reset, and turn the unit off, then on again to complete. Press **Esc** to return to normal operation without resetting.

Master Reset

This will restore factory setting to all system parameters, including Time/Date, Ethernet, language and brightness settings. Also, all user files in the internal memory are deleted, and the original language and antenna files are restored.

Press the **Enter** key to initiate the reset, and turn the unit off, then on again to complete. Press **Esc** to return to normal operation without resetting.

Update OS Via Ethernet

Select this soft key to update the instrument operating system via the Ethernet connection. Press Enter to begin the update, or press **Esc** to return to normal operation without updating.

Update OS Via USB

Select this soft key to update the instrument operating system via the USB connection. Press Enter to begin the update, or press **Esc** to return to normal operation without updating.

NOTE: The Update OS via Ethernet and Update OS via USB selections are accomplished in conjunction with the Master CodeLoader program, supplied with the Master Software Tools suite. Improper use of the Master CodeLoader program could render the system unusable.

Back

Returns to the previous menu.

NOTE: Use an applicable band pass filter to eliminate out of band signals that can cause mixer saturation.

Carrier Frequency

Carrier Frequency is the selected transmitter operating center frequency entered by the user or calculated from the signal standard and channel number entered by the user.

Carrier Feedthrough

Carrier Feedthrough measures the amount of unmodulated signal that is leaking through the transmitter and is displayed in the Code Domain Power display. The WCDMA 3GPP specification does not specify carrier feedthrough measurement.

CDP

Code Domain Power displays how much of the channel power is in each Orthogonal Variable Spreading Factor (OVSF). Power is normalized to the channel power, so if a code reads -10dB, it means that the code is 1/10th of the channel power. Colors are applied according to the following table:

Parameter	Description	Color	VIewable on Display
CPICH	Common Pilot Channel	Red	All CDP views
P-CCPCH	Primary Common Control Physical Channel	Magenta	All CDP views
S-CCPCH	Secondary Common Control Physical Channel	Cyan	All CDP views
PICH	Paging Indicator Channel	Green	All CDP views
P-SCH	Primary Sync Channel	Navy Blue	Control Channels
S-SCH	Secondary Sync Channel	Blue	Control Channels
Traffic	WCDMA Traffic	Yellow	All CDP views
Noise	Noise	Grey	All CDP views

NOTE: In WCDMA specification the P-SCH and S-SCH are not assigned spreading codes and therefore do not appear in the code domain power display. They have special non-orthogonal scrambling codes and are on 10% of the time.

Channel Power

Channel power is the total power transmitted in the 3.8 MHz WCDMA channel specified. Channel Power measures the node B/base station transmitting power across the entire 3.84 MHz WCDMA (UMTS) channel. Channel power is displayed in dBm and Watts.

Scrambling Code

In the WCDMA specification the scrambling code can be from 0 to 511. If the scrambling code is known, its value can be entered and the test set can decode and display the code domain power of the signal. If the scrambling code is unknown, the MS2717A can be set to auto scrambling so that the test set can lock on to the strongest code to decode and display the code domain power of the signal.

Spreading Factor (also called OVSF codes)

According to the 3GPP standard the spreading factor can be from 4 to 512, and the MS2717A can be set to a maximum spreading factor of 256 or 512.

Freq Error

Frequency error is the difference between the received center frequency and the specified center frequency. This is tied to the external frequency reference accuracy and is typically only useful with a good external frequency reference.

Codogram

When Codogram is selected the screen displays the changes in code power levels over time.

Noise Floor

The average power of inactive codes in the code domain, displayed in the CDP measurement display.

Threshold

The Active Channel Threshold Level can be set to indicate which code channels are considered active. Any code channels exceeding this power level are considered active traffic channels and any code channels below this power level are considered inactive (or noise). A horizontal red line on the screen represents the threshold level. The MS2717A can set this level automatically based on the received signal, or the user can manually enter a value in the Threshold setup menu.

Occupied Bandwidth

The measured occupied bandwidth is calculated as the bandwidth containing 99% of the total integrated power within the transmitted spectrum around the selected center frequency.

EVM (Error Vector Magnitude)

The Error Vector Magnitude is the ratio in percent of the difference between the reference waveform and the measured waveform. EVM metrics are used to measure the modulation quality of a transmitter. The 3GPP standard requires the EVM not to exceed 17.5%.

Symbol EVM (@EVM)

Symbol EVM is defined as the EVM for a single code channel.

Peak to Average Power

Peak to Average power is the ratio of the peak power and the RMS power of the signal calculated over one frame interval and is displayed in dB.

Peak CD Error (Peak Code Domain Error)

PCDE takes the noise and projects the maximum impact it will have on all OVSF codes. PCDE is the maximum value for the code domain error for all codes (both active and inactive).

In the 3GPP standard to address the possibility of uneven error power distribution in WCDMA, the EVM measurement has been supplemented with PCDE. The 3GPP standard requires the PCDE not to exceed -33dB at a spreading factor of 256.

Ec

Ec is a measurement of energy. Ec is determined by multiplying CPICH by the chip time.

Ec/Io

The pilot power compared to the total channel power. Ec/Io is displayed in text only and OTA measurement displays.

Pilot Dominance

The strength of the strongest pilot compared to the next strongest pilot in the same channel. This should be >10 dB to make good measurements.

Total Power

The total power of all the scrambling codes, also called (Io) and displayed in dBm.

CPICH Abs Power

CPICH Abs power is the energy over one chip of the Common Pilot Channel power displayed in dBm.

P-CCPCH Abs Power

P-CCPCH Abs power is the absolute Primary Common Control Physical Channel power displayed in dBm.

S-CCPCH Abs Power

S-CCPCH Abs power is the absolute Secondary Common Control Physical Channel power displayed in dBm.

P-SCH Abs Power

P-SCH Abs power is the absolute Primary Sync Channel power displayed in dBm.

S-SCH Abs Power

S-SCH Abs power is the absolute Secondary Sync Channel Power displayed in dBm.

PICH

PICH is the paging indicator channel power.

Constellation

In the HSDPA view, the symbol constellation for the selected code is displayed (16QAM or QPSK).

Measurement Setup

Setting up the Measurement Frequency

The measurement frequency can be set by entering the center frequency or by selecting the applicable signal standard and channel, which allows the MS2717A to automatically set the frequency.

To enter the center frequency:

Step 1. Press the **Freq** function hard key.
Step 2. Press the Center Freq soft key.
Step 3. Enter the desired frequency using the keypad, the arrow keys, or the rotary knob. If entering a frequency using the keypad, the soft key labels change to GHz, MHz, kHz and Hz. Select the appropriate units key. Selecting the **Enter** key has the same affect as selecting the MHz soft key.
Step 4. Press the **Enter** key to set the Center Frequency. The current setting is shown on the left side of the display.

To select a signal standard:

Step 5. Press the **Freq** function hard key.
Step 6. Select the Signal Standard soft key.

Step 7. Use the Up/Down arrow keys or the rotary knob to highlight a signal standard and press **Enter** to select. When a signal standard is selected, the center frequency for the first channel of the selected standard is automatically tuned.

Step 8. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.

The current settings are displayed on the left side of the screen.

Power Offset for Compensating External Loss

To get accurate results the external attenuation should be compensated using power offset. In power offset mode the compensation factor is in dB. The external attenuation is caused by using an external cable or external high power attenuator.

Step 1. Press the **Amplitude** function hard key.

Step 2. Press the Power Offset soft key and use the keypad, the arrow keys, or the rotary knob to enter the desired offset value. Press the **Enter** key to set the Power Offset. The value entered is displayed on the left side of the screen.

Scrambling Code Setup

Scrambling codes can be set up a automatically or manually.

In Auto mode the unit automatically locks on to the strongest scrambling code in the signal. In Manual mode the desired code is manually entered and the unit looks only for that specific scrambling code.

To set up auto scrambling:

Step 1. Press the **Setup** function hard key.

Step 2. Press the Scrambling Code soft key to select Auto

To manually set up a Scrambling Code:

Step 3. Press the **Setup** function hard key.

Step 4. Press the Scrambling Code soft key to select Manual and use the keypad, the arrow keys, or the rotary knob to enter the desired Scrambling Code, as shown on the left side of the screen. Press the **Enter** key to set the scrambling code.

Maximum Spreading Factor Setup

In a WCDMA system, the number of chips per data symbol is called the Spreading Factor. The lower the spreading factor the higher the data rate. According to the 3GPP standard, the spreading factor can vary from 4 to 512 and the maximum spreading factor is either 256 or 512. The MS2717A can be set to 256 or 512 maximum spreading factors. To set up the maximum spreading factor:

Step 1. Press the **Setup** function hard key.

Step 2. Press the Max Spreading Factor soft key to select either 256 or 512.

External Reference Frequency Setup

In order to get the best frequency accuracy measurements, it is important to use an external reference frequency attached to the MS2717A Ext Ref In connector. Most node B equipment has a reference frequency available on a BNC connector. To configure the MS2717A to use an external reference frequency:

Step 1. Press the **Setup** function hard key.

Step 2. Press the Select Reference Frequency soft key to display a list of the available reference frequencies:

1 MHz

1.2288 MHz

1.544 MHz

2.048 MHz

2.4576 MHz

4.8 MHz

4.9152 MHz

5 MHz

9.8304 MHz

10 MHz

13 MHz

19.6608 MHz

Step 3. Use the Up/Down arrow keys or the rotary knob to highlight the applicable reference frequency on the list and press the **Enter** key to set the reference frequency.

As the MS2717A locks to the source, the Reference Freq value is displayed in the user settable parameters to the left of the display.

S-CCPCH Spreading Factor, S-CCPCH Code and PICH Code setup

In the 3GPP specification, two optional control channels are provided for S-CCPCH and PICH. These codes can have different spreading codes and spreading factors. In the MS2717A the S-CCPCH spreading factor and S-CCPCH and PICH codes can be manually entered.

> NOTE: For the most accurate results, manually enter the S-CCPCH spreading and S-CCPCH and PICH codes before taking the measurement.

Step 1. Press the **Setup** function hard key.

Step 2. Select the S-CCPCH Spread soft key and manually enter the desired spreading factor.

Step 3. Select the S-CCPCH Code soft key and manually enter the desired spreading code.

Step 4. Select the PICH Code soft key and manually enter the desired spreading code.

> NOTE: The S-CCPCH spreading factor default value is 256. The default S-CCPCH Code is 3 and the default PICH code is 16.

Threshold Setup

The threshold level is an advanced setting that can be set to indicate which codes are considered active. In the Code Domain Power screen the threshold level is indicated by a horizontal dotted red line. Any code channels exceeding this power level are considered active

traffic channels and any code channels below this power level are considered inactive or noise. The threshold level can be manually set by:

Step 1. Press the **Setup** function hard key.
Step 2. Select the Threshold soft key and select either On or Off.

NOTE: Threshold can only be set in Codogram or Code Domain Power modes. The default threshold level is -30 dB.

Filtered versus Unfiltered Power

In the MS2717A, the ACLR measurement uses the filtered channel power to determine the ACLR values and it is listed as filtered on the display. In all other screens the unfiltered channel power is displayed as channel power.

WCDMA/HSDPA RF Measurements

The WCDMA/HSDPA RF Measurements consist of three measurements: Spectrum, Adjacent Channel Leakage Ratio (ACLR) and Spectral Emission Mask. To make WCDMA RF measurements, connect the MS2717A to the node B equipment following the instructions.

Band Spectrum

Displays the selected band spectrum. The cursor can be moved to select the desired channel using the directional arrow keys or the rotary knob. The Channel Number can also be directly entered using the numerical keypad.

NOTE: Selecting Channel Spectrum after selecting a channel using the cursor will display the measurements for the selected signal.

Band Spectrum Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.
Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.
Step 3. Press the **Freq** function hard key.
Step 4. Press the Signal Standard soft key and select the applicable WCDMA standard.
Step 5. Press the **Measurements** function hard key and the RF Measurements soft key.
Step 6. Press the Band Spectrum soft key to display the band spectrum.
Step 7. Move the cursor, using the directional arrow keys or the rotary knob, to select the desired channel. The Channel Number can also be directly entered using the numerical keypad.

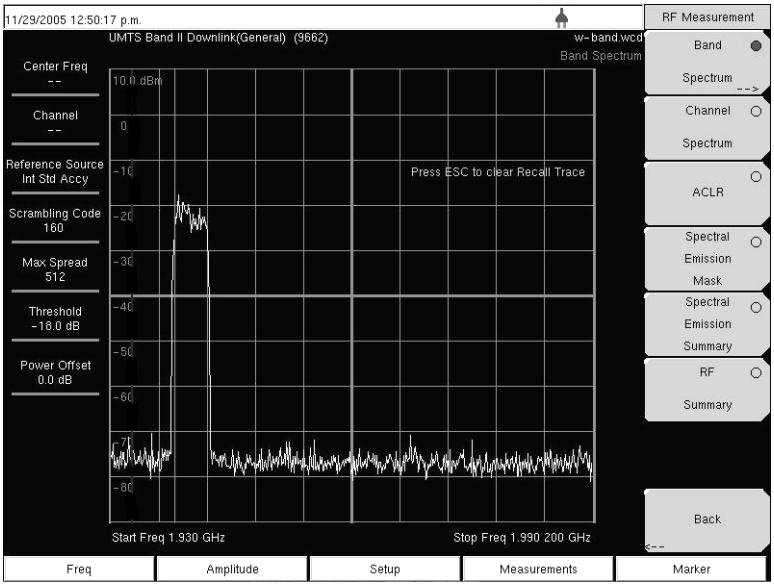

Figure 6-8. Band Spectrum

Channel Spectrum

The channel spectrum screen displays the selected channel signal and the following measurements: channel power in dBm and Watts, occupied bandwidth, and peak to average power. When Channel Spectrum is selected, the unit automatically displays the measurements for the selected signal.

Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.
Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.
Step 3. Press the **Freq** function hard key.
Step 4. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.
Step 5. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.
Step 6. Press the **Setup** function hard key.
Step 7. For the most accurate frequency measurements, press the Select Reference Frequency soft key to display a list of the available reference frequencies and select the desired reference frequency (see page 4-20) and synchronize the Spectrum Analyzer.
Step 8. Press the **Measurements** function hard key.
Step 9. Press the RF Measurements soft key.
Step 10. Press the Channel Spectrum soft key to activate the spectrum measurement. The red dot on the soft key indicates it is selected.

NOTE: Using the Band Spectrum cursor, select the desired channel and the unit will automatically display the measurements for the selected channel when the Channel Spectrum key is selected.

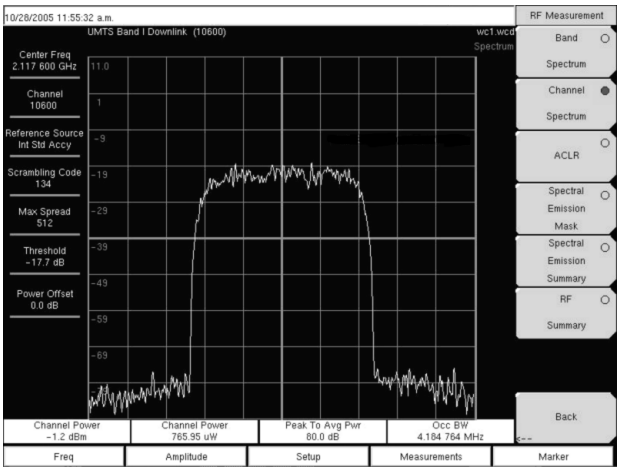

Figure 6-9. RF Measurement Example

ACLR Measurement Screen

ACLR (Adjacent Channel Leakage Ratio) is defined as the ratio of the amount of leakage power in an adjacent channel to the total transmitted power in the main channel and is dis-

played in table format under the bar graph. The 3GPP standard specifies one main channel and two adjacent channels. The ACLR screen displays the main channel power and the power of two adjacent channels on each side as a bar graph.

The channel spacing is -10 MHz, -5 MHz, +5 MHz and +10 MHz and the channels are color coded. The 3GPP standard requires the adjacent channel power leakage ratio to be better than 45 dB at 5MHz offset and 50 dB at 10MHz offset.

ACLR measurements can also be made for multi-channel systems by measuring the main channels and the adjacent channels, from one to four channels. The ACLR screen can display up to 12 channels total.

In the ACLR measurement mode the filtered channel power is used to determine ACLR values and is listed as filtered on the display.

The following procedure is for one main channel two adjacent channels.

Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.

Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.

Step 3. Press the **Freq** function hard key.

Step 4. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.

Step 5. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.

Step 6. Press the **Measurements** function hard key.

Step 7. Press the RF Measurement soft key.

NOTE: In the MS2717A with Option 45, the ACLR measurement uses the filtered channel power to determine the ACLR values and it is listed as filtered on the display. In all other screens the unfiltered channel power is displayed as channel power.

Step 8. Press the ACLR soft key to activate the ACLR measurement. The red dot on the soft key indicates it is selected.

NOTE: Using the Band Spectrum cursor, select the required channel and press the ACLR soft key. The MS2717A will display the measurement.

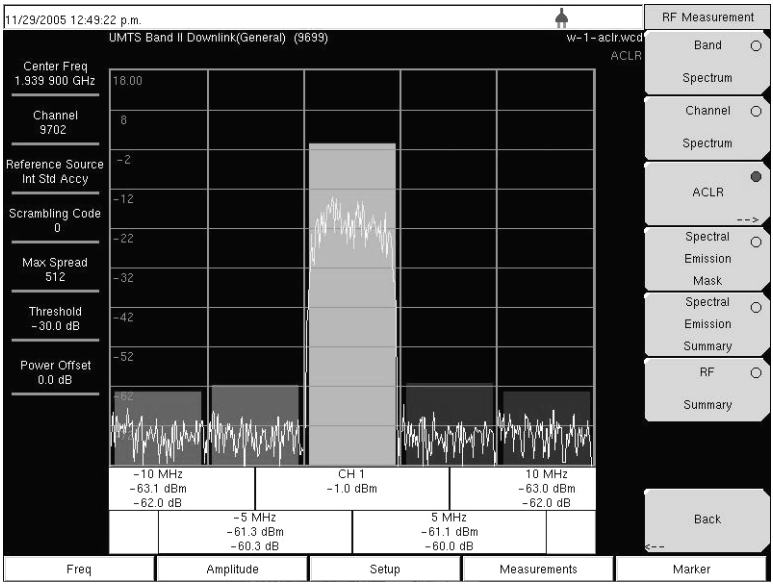

Figure 6-10. ACLR Measurement Example

Step 9. Press the ACLR soft key again and select one main channel and two adjacent channels.

Multi-channel ACLR Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.

Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.

Step 3. Press the **Freq** function hard key.

Step 4. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.

Step 5. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.

Step 6. Press the **Measurements** function hard key.

Step 7. Press the RF Measurement soft key.

Step 8. Press the ACLR soft key to activate the ACLR measurement. The red dot on the soft key indicates it is selected.

Step 9. Press the ACLR soft key again and select the number of main and adjacent channels. For this example four main channels and four adjacent channels are selected.

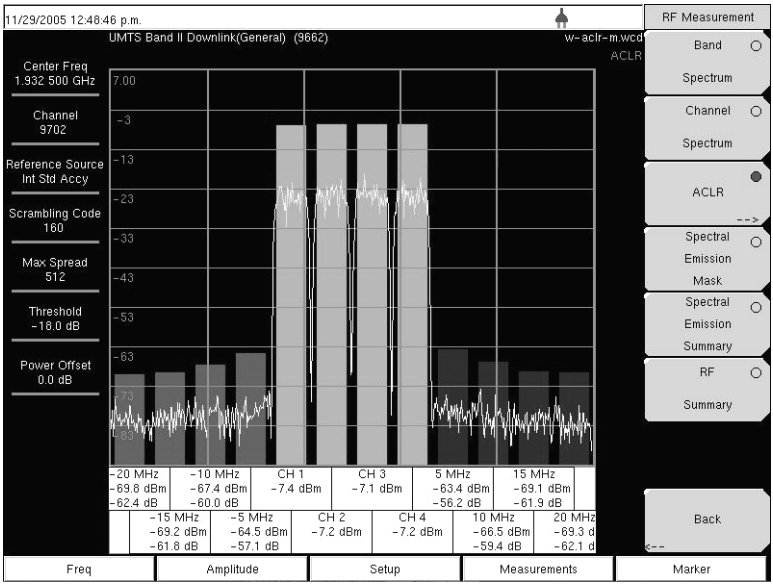

Figure 6-11. ACLR Multi-channel Measurement Example

Spectral Emission Mask

The Spectral Emission Mask displays the selected signal and the mask as defined in the 3GPP specification. The mask varies depending upon the input signal. The MS2717A also indicates if the signal is within the specified limits by displaying PASSED or FAILED. The emission mask is also displayed in a table format with different frequency ranges and whether the signal PASSED/FAILED in that region.

The 3GPP specification specifies four masks depending upon the base station output power:

- P Š 43 dBm
- 39 £ P < 43 dBm
- 31 £ P < 39 dBm
- P < 31 dBm

Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key. The available modes are Spectrum Analyzer and WCDMA Signal Analyzer.

Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.

Step 3. Press the **Freq** function hard key.

Step 4. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.

Step 5. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.

Step 6. Press the **Measurements** function hard key.

Step 7. Press the RF Measurements soft key.

Step 8. Press the Spectral Emission Mask soft key to activate the Spectral Emission Mask measurement. The red dot on the soft key indicates it is selected.

Step 9. Press the Spectral Emission Summary soft key to display the Spectral Emission Summary table. The red dot on the soft key indicates it is selected.

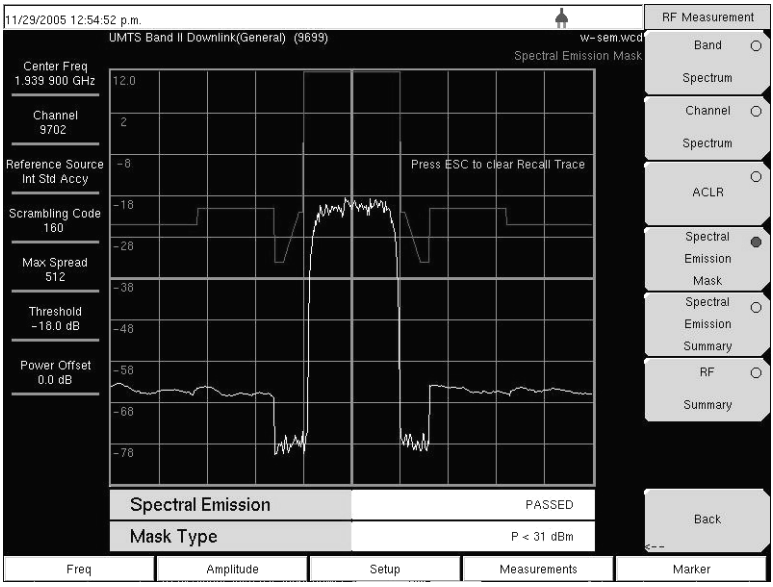

Figure 6-12. Spectral Emission Mask Measurement Example

For a Spectral Emission Summary:

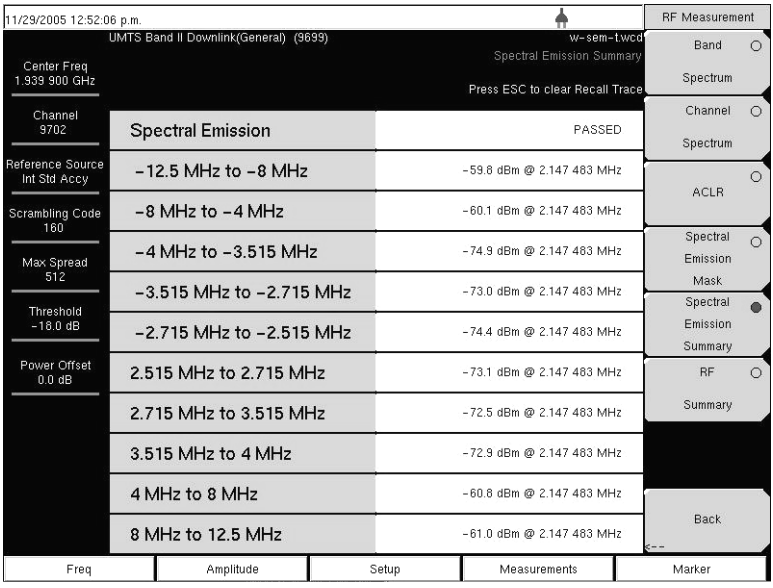

Figure 6-13. Spectral Emission Mask Measurement Summary Example

RF Summary

The RF Summary displays the critical transmitter performance measurements in the table format, without demodulating the WCDMA/HSDPA signal. The parameters displayed in the RF summary table are Channel Power in dBm and Watts, Carrier Frequency, Frequency Error, Spectral emission Pass/Fail criteria, Occupied Bandwidth, Peak to Average Power, ACLR at -10 MHz, -5 MHz, 5 MHz and 10 MHz channels.

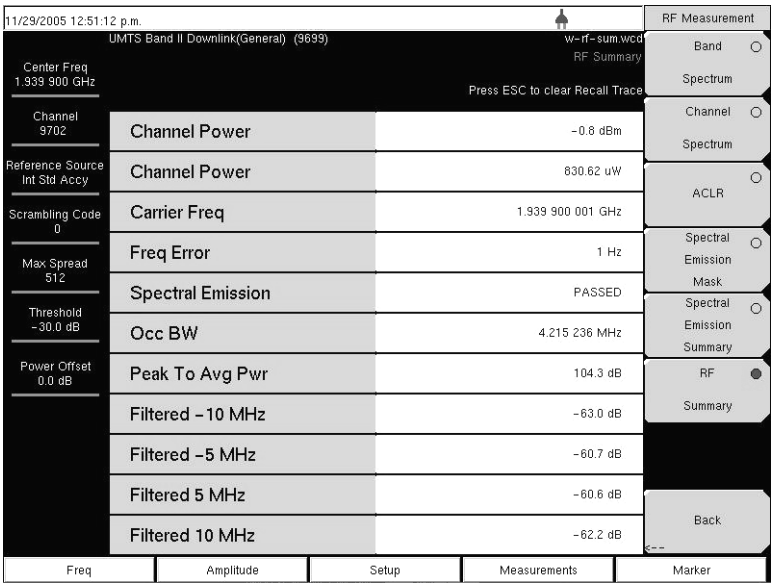

Figure 6-14. RF Summary Example

Demodulator

In the demodulator mode (Option 45) the MS2717A is connected to the node B equipment and the unit will demodulate the WCDMA signal.

Zoom Function

In CDP and Codogram measurements, the Zoom function can be activated to zoom in on selected OVSF codes. The Zoom function can be set to start from a particular OVSF code.

> NOTE: Press CDP or Codogram twice to activate the zoom function. The arrow in the lower right corner of the soft key indicates a sub menu is available.

Code Domain Power (CDP)

The Code Domain Power (CDP) display includes spreading factor (OVSF codes) 256 or 512 with zoom in on codes. The MS2717A can zoom to 32, 64 and 128 codes and the user can input the zoom code to start the zoom in from the entered OVSF codes. The demodulator also displays CPICH, P-CCPCH, S-CCPCH, PICH, P-SCH and S-SCH power in the table format. For WCDMA/HSDPA Demodulator, the HSDPA codes are also displayed.

Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.
Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.
Step 3. Press the **Freq** function hard key.
Step 4. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.
Step 5. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.
Step 6. Press the **Setup** function hard key.
Step 7. Press the Scrambling Code soft key to select Auto so that the Scrambling Code will be automatically detected.
Step 8. Press the Select Reference Frequency soft key to display a list of the available reference frequencies and select the desired reference frequency to get accurate frequency measurements.
Step 9. Connect the external reference to the Ext RF Input BNC connector and wait for the unit to recognize the external reference (page 6-19) and lock up to it.
Step 10. Press the S-CCPCH Spread soft key to manually set the S-CCPCH spreading. The MS2717A will display the default S-CCPCH spreading factor of 256 in all the views. Set the S-CCPCH spreading factor to show accurate results.
Step 11. Press the S-CCPCH Code soft key to enter the correct S-CCPCH code. The MS2717A will display the default S-CCPCH code of 3 in all the views. Set the S-CCPCH code to show accurate results.
Step 12. Press the PICH Code soft key to enter the correct PICH code. The MS2717A will display the default PICH code of 16 in all the views. Set the PICH code to show accurate results.
Step 13. Press the Threshold soft key to manually set the Threshold level which determines which codes are active. The default value is -30dB.
Step 14. Press the **Measurements** function hard key.
Step 15. Select the Demodulator soft key to activate the demodulator menu.
Step 16. Press the CDP soft key to activate the CDP measurement. The red dot on the soft key indicates it is selected.
Step 17. Press the CDP soft key again to activate the zoom function.
Step 18. Press the Zoom soft key to select the appropriate zoom level. The Zoom key toggles between 32, 64 and 128.

Step 19. Press the Zoom Start soft key to manually enter the zoom start code.
Step 20. Press the Back soft key to go back to the CDP measurement.

NOTE: The blue color block on the CDP screen represents the selected zoom codes and the same codes are displayed in the zoom screen.

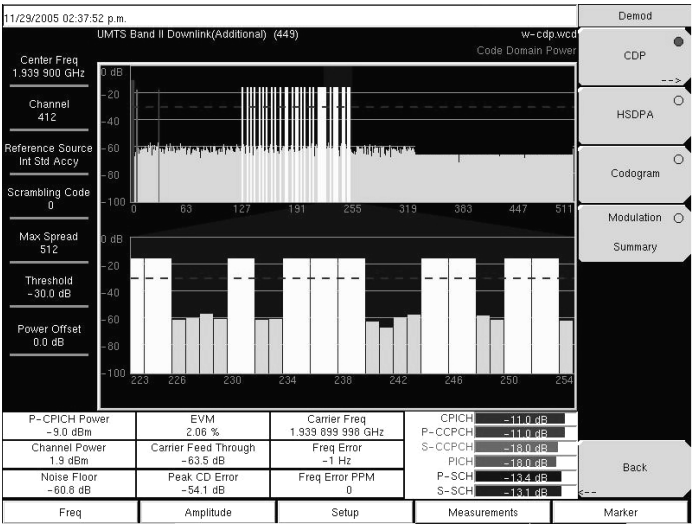

Figure 6-15. WCDMA Code Domain Power Measurement Screen Example

Activating Markers

Step 1. Press the **Marker** function hard key to display the Marker menu.

Step 2. Press the Marker soft key to select the appropriate marker (1-6). The underlined marker number is the currently selected marker.

Step 3. Press the On/Off soft key to activate the selected marker.

Step 4. Press the Marker Table soft key to display the Marker table. The marker table is displayed on the screen below the CDP measurements table.

NOTE: Markers can be used to read the individual code power, symbol EVM (@ EVM) and type of code and can be activated in all the WCDMA measurements.

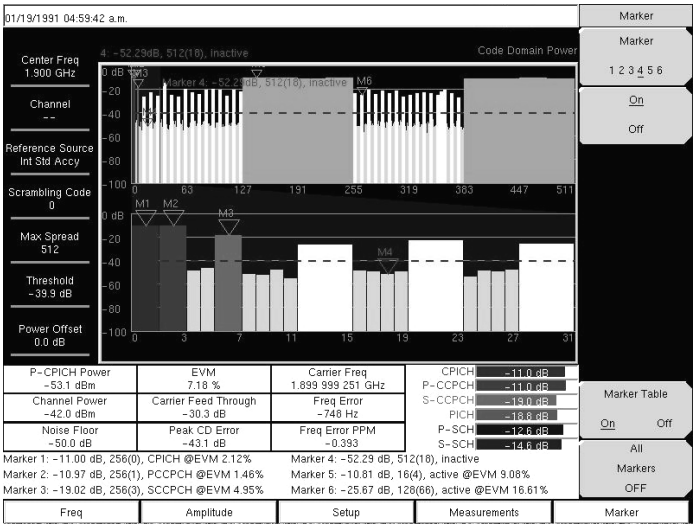

Figure 6-16. Code Domain Power Measurement Screen Example with Markers Activated

NOTE: The WCDMA modulation type is QPSK.

Codogram

Codogram displays the code power levels over time. Two graphs are displayed on the screen, the top one displays all the selected OVSF codes and the bottom one displays the selected OVSF zoom codes.

Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.

Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.

Step 3. Press the **Freq** function hard key.

Step 4. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.

Step 5. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.

Step 6. Press the **Setup** function hard key.

Step 7. Press the Scrambling Code soft key to select Auto so that the MS2717A will automatically detect the scrambling code.

Step 8. Press the Select Reference Frequency soft key to display a list of the available reference frequencies and select the desired reference frequency to get accurate frequency measurements (see page 4-20).

Step 9. Press the S-CCPCH Spread soft key to manually set the S-CCPCH spreading. The MS2717A will display the default S-CCPCH spreading factor of 256 in all the views. Set the S-CCPCH spreading factor to show accurate results.

Step 10. Press the S-CCPCH Code soft key to enter the correct S-CCPCH code. The MS2717A will display the default S-CCPCH code of 3 in all the views. Set the S-CCPCH code to show accurate results.

Step 11. Press the PICH Code soft key to enter the correct PICH code. The MS2717A will display the default PICH code of 16 in all the views. Set the PICH code to show accurate results.

Step 12. Press the Threshold soft key to manually set the Threshold level which determines which codes are active. The default value is -30dB.

Step 13. Press the **Measurements** function hard key.

Step 14. Select the Demodulator soft key to activate the demodulator menu.

Step 15. Press the Codogram soft key to activate the Codogram measurement.

Step 16. Press the Codogram soft key to activate the zoom function and to set the time for the measurement.

Step 17. Press the Zoom soft key to select the appropriate zoom level. The Zoom key toggles between 32, 64 and 128.

Step 18. Press the Zoom Start soft key to manually enter the zoom start code.

Step 19. Press the Total Time or Single Sweep Time soft key to set the required time.

Step 20. Press the Back soft key to go back to the Codogram measurement.

NOTE: The blue color block on the Codogram screen represents the selected zoom codes and the same codes are displayed in the zoom screen.
Save the data before making any measurements, otherwise the data will be lost.

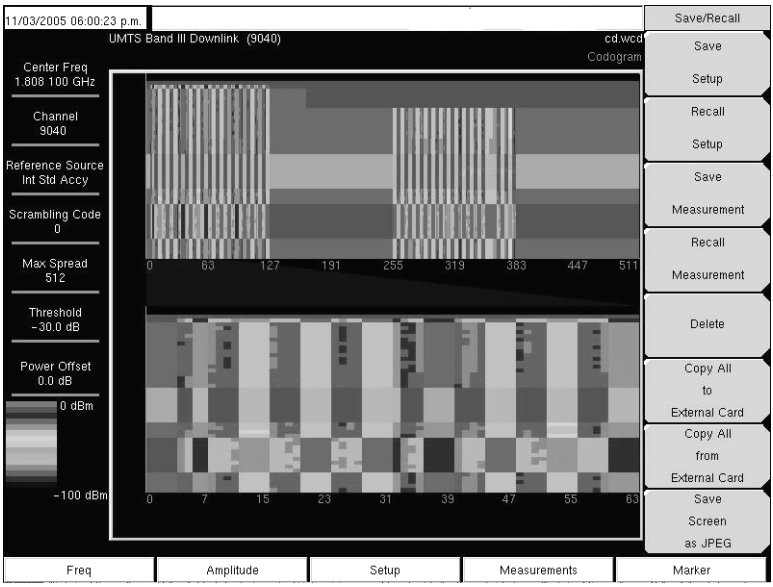

Figure 6-17. Codogram Measurement Screen Example

WCDMA Summary

WCDMA summary displays the critical WCDMA measurements from RF and demodulation measurements.

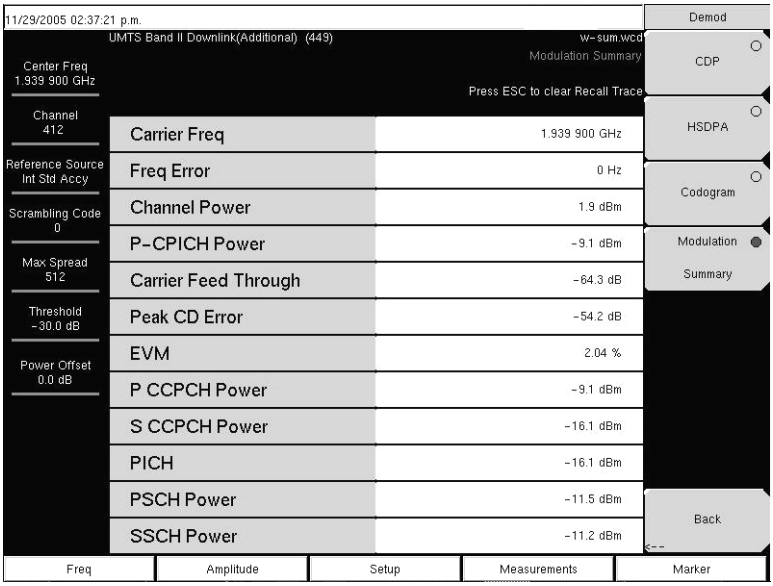

Figure 6-18. WCDMA Summary Measurement Screen Example

WCDMA Summary Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.

Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.

Step 3. Press the **Freq** function hard key.

Step 4. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.

Step 5. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.

Step 6. Press the **Setup** function hard key.

Step 7. Press the Scrambling Code soft key to select Auto so that the MS2717A will automatically detect the scrambling code.

Step 8. Press the Select Reference Frequency soft key to display a list of the available reference frequencies, Select the desired reference frequency to get accurate frequency measurements and synchronize the Spectrum Analyzer.

Step 9. Connect the external reference to the Ext RF Input BNC connector and wait for the unit to recognize the external reference and lock to it.

Step 10. Press the S-CCPCH Spread soft key to manually set the S-CCPCH spreading. The MS2717A will display the default S-CCPCH spreading factor of 256 in all the views. Set the S-CCPCH spreading factor to show accurate results.

Step 11. Press the S-CCPCH Code soft key to enter the correct S-CCPCH code. The MS2717A will display the default S-CCPCH code of 3 in all the views. Set the S-CCPCH code to show accurate results.

Step 12. Press the PICH Code soft key to enter the correct PICH code. The MS2717A will display the default PICH code of 16 in all the views. Set the PICH code to show accurate results.

Step 13. Press the Threshold soft key to manually set the Threshold level which determines which codes are active. The default value is -30dB.
Step 14. Press the **Measurements** function hard key.
Step 15. Press the WCDMA Summary soft key.

Pass/Fail Mode

The MS2717A stores the five test models specified in the 3GPP specification (TS 125.141) for testing base station performance and recalls these models for quick easy measurements. After selection of a test model, the MS2717A displays test results in tabular format with clear PASS or FAIL indications that include min/max threshold.

Using Master Software Tools, a custom test list can be created and downloaded into the MS2717A. All critical parameters can be selected for pass/fail testing, including each individual code power level, the spreading factor and symbol EVM.

Pass/Fail Mode Procedure

Step 1. Select the **Shift** key, then the **Mode** (9) key.
Step 2. Use the directional arrow keys or the rotary knob to highlight WCDMA/HSDPA Signal Analyzer and press the **Enter** key to select.
Step 3. Connect the appropriate antenna to the RF In connector to make OTA measurements.
Step 4. Press the **Freq** function hard key.
Step 5. Press the Center Freq soft key and enter the desired frequency manually, or press the Signal Standard soft key and select the applicable WCDMA standard.
Step 6. Select the Channel soft key and use the Up/Down arrow keys, the keypad, or the rotary knob to select a channel number for the selected signal standard. The center of the channel is tuned to the center of the display.
Step 7. Press the **Measurements** function hard key.
Step 8. Press the Pass/Fail Mode soft key to display the pass/fail mode menu.
Press the Select Pass/Fail Test soft key and select the applicable Test Model to activate the measurement.

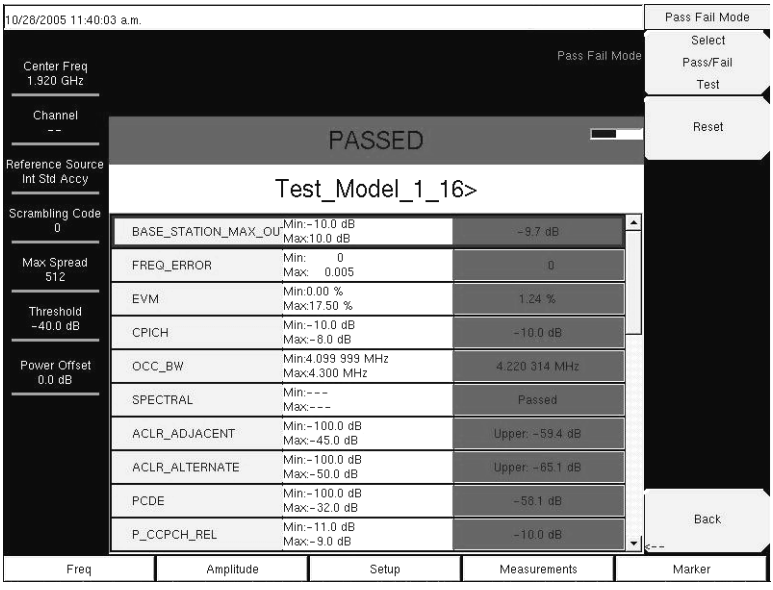

Figure 6-19. Pass/Fail Mode Example Screen

Chapter 7
Master Software Tools

Introduction

This chapter provides a description of the Anritsu Master Software Tools program. Master Software Tools is a suite of Microsoft Windows programs for transferring saved measurements, along with markers and limit lines, to a PC display. The programs provide the ability to modify display parameters, overlay multiple traces (Spectrum Analyzer mode), upload and download traces, print traces using local or networked printers, create or modify language files, edit the cable and signal standard lists, and convert .dat files to the new .vna format.

Master Software Tools requires Windows 2000 or Windows XP, and will not function on earlier versions of the Microsoft Windows operating system, as the program relies on the Windows 2000 and Windows XP .NET Framework.

Features

The Master Software Tools Suite provides the following features and capabilities:

- Download measurements saved in the instrument memory to the PC for storage and analysis
- Capture live traces from the instrument and view them on the PC
- Upload measurements from the PC to the instrument memory
- Compare multiple traces using drag, drop, and trace overlay features (SPA mode)
- Add or modify Limit Lines (Spectrum Analyzer mode only) and Markers
- Modify the Signal Standard List and new lists to the instruments using the Cable and Signal Editors
- Display power level and calibration status information along with a trace in one professional report
- Create custom language files that can be uploaded to the instrument
- Export measurement data as text files for use in a spreadsheet (.txt and .dat file formats)
- Export measurements as graphic files (.jpg, .wmf, .bmp, and .png file formats)
- Automatically update the instrument with the latest firmware available from the Anritsu web site
- Handle long file names for easy, descriptive data labeling
- Store an unlimited number of data traces to a PC easing the task of analyzing and monitoring historical performance
- Create and download new signal standards, Pass/Fail Mode custom lists and antenna factors to existing lists into the unit
- Establish a connection to a PC using USB, Ethernet LAN, or Direct Ethernet

System Requirements

Minimum requirements and recommendations are:

- Microsoft Windows 2000 or Windows XP
- Intel Pentium 233 MHz microprocessor minimum (Pentium II 350 MHz or better recommended)
- 128 MB of RAM minimum (256 MB or above recommended)
- Hard disk drive with approximately 80 MB of available space (An additional 80 MB free space for storage of captured plots is recommended.)
- A USB port (USB 1.2 required, USB 2.0 recommended) or an Ethernet 10/100 T connection for communication with the instrument

Installation

To install the Master Software Tools program, insert the Anritsu Master Software Tools disk in the CDROM drive. Follow the instructions in the installation program to install the software. If the autorun feature is disabled in your computer, click on the Windows Start menu, and select Run. Type: X:\Setup.exe, where X is the drive letter of the CDROM drive, and follow the instructions in the installation program.

> NOTE: Master Software Tools requires Windows 2000 or Windows XP. Master Software Tools will not function on earlier versions of the Microsoft Windows operating system, as the program relies on the Windows 2000 and Windows XP .NET Framework.

The readme.doc file on the disk provides updated information about the program, and the Help function provides detailed operating information from within the program.

To start the Master Software Tools program, double-click on the Master Software Tools desktop icon, or select Programs from the Windows Start menu and select Anritsu, then Master Software Tools to launch the program.

Connection

The instrument can be connected to the PC using a USB connection, an Ethernet LAN connection, or a Direct Ethernet connection.

USB Connection

The instrument can be connected to the PC using the included USB cable (2000-1360). Connect the cable to the USB port on the computer and to the USB port on the instrument.

When using the USB cable to connect to the instrument, select Connection from the menu bar, and then Connect: USB to establish a connection.

If a USB connection was already established in a previous session, the Connect: USB icon will be displayed on the tool bar. Click on the icon to connect to the instrument.

The Connect: USB icon will change from red to green when communication is established. If the status bar is turned on (View Status Bar), a message at the bottom will display Connected to device using USB when communication is established.

Ethernet LAN Connection

The RJ-45 connector is used to connect the VNA Master to a local area network using the provided Ethernet cable (2000-1371). Integrated into the connector on the instrument are two LEDs. The amber LED indicates the presence of LAN voltages—a live LAN connection—while the green LED flashes to show that LAN traffic is present. The instrument IP address is set by pressing the **Shift** key, then the **System** (8) key followed by the System Options soft key and the Ethernet Config soft key. The instrument Ethernet address can be set

automatically using DHCP, or manually by entering the desired IP address, gateway address and subnet mask. Refer to Chapter 2 for more information on using DHCP.

The Network Connection window can be used to search the local subnet (hub) for connected instruments. Double click on the matching IP address of the instrument to establish a connection to the instrument.

> NOTE: The network cable must be connected to the network before powering on the UMTS Master.

The Connect: Ethernet icon will change from red to green when communication is established. If the status bar is turned on, a message at the bottom will display Connected to Ethernet when communication is established.

To set or view the IP address of the instrument:

Step 1. On the instrument, press the **Shift** key, then the **System** (8) key.
Step 2. Select the System Options soft key, and then the Ethernet Config soft key. The Ethernet Editor will display the present IP information of the unit. When using DHCP, the Ethernet cable must be connected before the instrument is turned on.
Step 3. Press the **Esc** key to close the Ethernet Editor dialog box.
Step 4. On the PC, open the Connection window and select Enter IP Address.
Step 5. Enter the IP address of the instrument as shown in the Ethernet Editor dialog box.
Step 6. Click on the Connect: Ethernet icon to establish the connection. The icon will change from red to green when communication is established.

Direct Ethernet Connection

When using a direct Ethernet connection, the instrument address must be set as follows:

Step 1. On the instrument, press the **Shift** key, then the **System** (8) key.
Step 2. Select the System Options soft key, and then the Ethernet Config soft key.
Step 3. Press the Type soft key to select Manual.
Step 4. Set the IP address to 10.0.0.2 using the soft keys or the Left/Right arrow keys to select the field to be modified. Use the keypad, the Up/Down arrow keys or the rotary knob to enter the input. Press **Enter** to accept the changes.
Step 5. Press the Field soft key and set the Subnet mask to 255.255.255.0. Press **Enter**.
Step 6. On the computer, open Anritsu Master Software Tools.
Step 7. Open the Connection menu and select Enter IP Address. Enter the IP address and press Ok. The IP address will be displayed in the toolbar at the top of the screen.
Step 8. Click on the red icon just to the left of the IP address. The icon will turn green when a connection is established with the instrument.

After the connection is established, the message Connected to 10.0.0.2 will be displayed at the bottom of the Connection Manager window.

Using Master Software Tools

An example of the Master Software Tools screen is shown below highlighting some of the features that are further explained in this section.

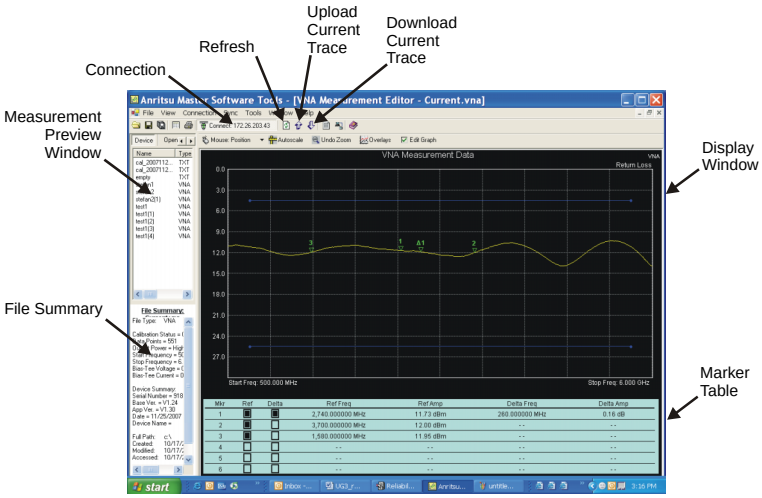

Figure 7-1. Master Software Tools Screen

Measurement Preview Window

Click on the Device tab in the Measurement Preview Window and the name and type of all files stored in the internal memory of the connected instrument will be displayed in this window. Double click on a file name to view it on the PC screen. A copy of the file will be placed in the C:\Program Files\Anritsu\Anritsu Master Software Tools directory unless the settings are changed in the File Manager pane on the left of the screen.

If a new measurement is saved in the instrument memory, select the Sync menu and select Refresh Device Measurement List to add it to the list in Master Software Tools.

The Open tab displays a list of all the measurements that were opened in the current session.

The Network tab displays a list of all the instruments connected to the local network that are on the same SubNet.

The Local tab opens a window to locate measurements already on the PC. Double click on a file name to view it on the PC screen.

File Summary

The File Summary window displays the file type, when it was last saved, the size, when it was modified, and the location on the network or hard drive. To show or hide the file summary, select the View menu and select or deselect File Summary.

Connection

Click on the Connection window to establish a connection to the instrument.

Refresh

If a new measurement is saved in the instrument memory, click on the Refresh icon, or select the Sync menu and select Refresh Device Measurement List to add it to the list.

Download the Current Trace to the PC

To download the current trace on the instrument display to the PC, select the Sync menu and select Capture Current Measurement or click on the down arrow icon. The current measurement on the instrument screen will be displayed on the PC screen.

Upload the Current Trace From the PC to the Instrument

To upload a trace file from the PC to the instrument, select the Sync menu and select Upload Active Window or click on the up arrow icon to upload the currently selected file from the PC to the instrument.

Download Stored Files From the Instrument to the PC

Select the Sync menu and select Download all Measurements. Select the location on the PC to store the measurements and select OK.

Plot Properties

Right clicking on the display window will bring up the Plot Properties window. All the functions needed to add or edit markers, limit lines, display modes, amplitude scaling, and trace math can be found in this window.

Markers

In Spectrum Analyzer mode, up to six reference and delta markers can be turned on and edited as needed using Master Software Tools. The Marker Table displays the amplitude and frequency values for all reference and delta markers simultaneously. To access the marker functions, right click on the Display Window and select Data Markers, then Marker Table, or right click on the Display Window and select Data Display Mode... then Data Display Option, then Marker Table.

Add Marker

To add a new Marker, display the Marker Table and mark the selection box for the desired reference or delta marker. Up to six markers and delta markers can be displayed at the same time.

Edit Marker

To edit a Marker, place the cursor on the marker, press the left mouse button and drag the marker to the new position. The markers can be turned on and off by selecting or deselecting the selection box in the Marker Table. The value of one marker is always displayed in the upper right part of the display. If more than one marker is turned on, and the Marker Table is turned off, click on the marker to display its value.

The marker can also be moved by rolling the scroll button on the mouse up or down to move the marker to the right or left, respectively.

Limit Lines

Single and segmented upper and lower limit lines can be turned on as needed. To turn on the Limit Lines, right click on the Display Window, select Data Display Mode… and select Data Display Options, or right click on the Display Window and select View Limit Lines (Upper and Lower).

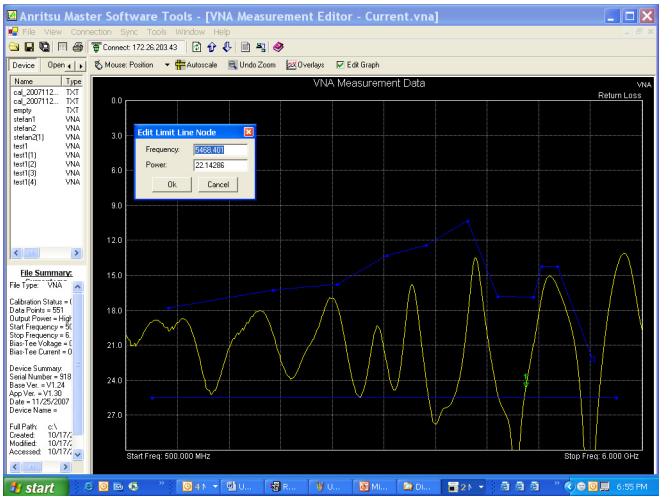

Figure 7-2. Limit Lines

Edit a Single Limit Line

There are several ways to edit the limit lines.

Method 1 (Enter the value of the Limit Line)

Step 1. Right Click on the Display Window.
Step 2. Select Data Display Mode.
Step 3. Enter the value of the upper and/or lower limit line.

Method 2 (Enter the value of the nodes)

Step 1. Turn on the Limit Line.
Step 2. Place the cursor on the start or end node and click once on the node.
Step 3. Right Click and select Edit Node
Step 4. Enter the frequency and amplitude of the start node.
Step 5. Move the cursor to the end node.
Step 6. Right click and select Edit Node.
Step 7. Enter the frequency and amplitude of the end node

Method 3 (Drag the start and end points)

Step 1. Turn on the Limit Line.
Step 2. Place the cursor on the start node and drag it to the desired position.
Step 3. Place the cursor on the end node and drag it to the desired position.

Edit Segmented Limit Lines

Segmented limit lines can be created in Master Software Tools.

Step 1. Right click on the Display Window and select View Limit Lines.
Step 2. Right click on the start or stop node and select Add Node to add a node or Delete Node to delete a node.

Step 3. Use the left mouse button and drag the new node to its new location or select Edit Node and enter the desired amplitude and frequency value of the new node.

Change the Amplitude Scale

Right click on the Display Window and select Data Display Mode then Plot Properties. Enter the top and bottom value for the appropriate graph selection.

Autoscale adjusts the Top and Bottom values so that the trace will be shown in the middle of the display.

Change the Display Units

Right click on the Display Window and select Data Display Mode then Plot Properties. Possible selections for DTF measurements are meters, feet, and time (ns).

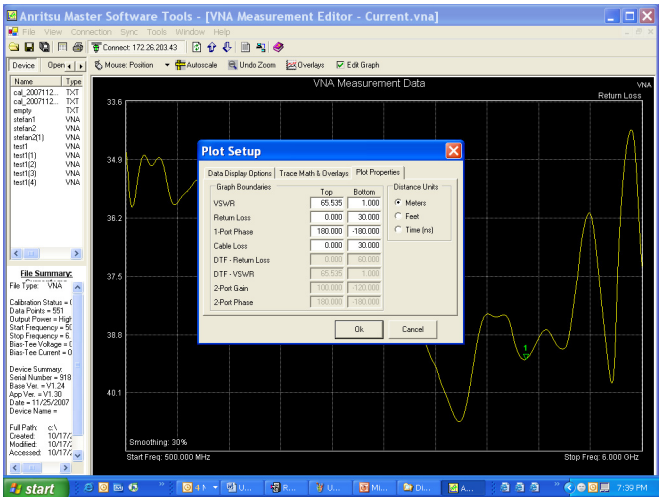

Figure 7-3. Scale Window

Trace Math

To use trace math to add or subtract two traces, right click on the Display Window and select Data Display Options then Trace Math & Overlays. Select Add and locate the file that the current trace will be compared to.

There are three mathematical operations available:

Current Trace - Memory
Memory - Current Trace
Current Trace + Memory.

Select Show Original Trace to show the current trace along with the trace obtained from the Trace Math.

Trace Smoothing

Trace Smoothing averages each point with X other datapoints. If smoothing is set to 5% and the number of datapoints is 551, then each point will be averaged with a total of 27 points (5% of 551) or 13 points to the left and 13 points to the right of each point. If the datapoint that is being averaged does not have enough datapoints to the left or to the right to average with, averaging will be done with all the available datapoints.

To select Trace Smoothing, right click on the Display Window and select Data Display Mode, then Trace Math & Overlays.

Select the Smoothing box and enter the desired smoothing percentage. It is also possible to view the original trace and see how the smoothing changes.

The percentage of smoothing can be changed on the display by placing the cursor on the smoothing percentage number at the bottom left of the display. Use the scroll button on the mouse and scroll up or down to increase or decrease the smoothing percentage and view the changes in real time.

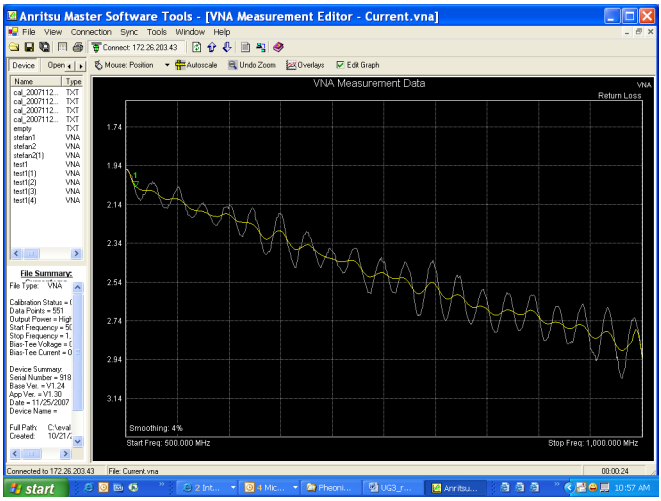

Figure 7-4. Trace Smoothing

Mouse Function

Click on the arrow in the Mouse Position drop down box and select Position, Distance, Zoom, or Overlay.

Position

Place the cursor on a point of the trace and click the left mouse button to display frequency and amplitude values. For DTF measurements, distance and amplitude values are displayed.

Zoom

To zoom in on a portion of a measurement, position the mouse cursor so as to draw a box over the area to be expanded. Press the left mouse button and drag the mouse to the right to cover the area. When the mouse button is released, the display zooms in on the selected area. The amplitude is auto-scaled so that the entire amplitude range of the selected frequency range can be seen.

To undo the zoom, right click and select Undo Zoom or click on the Undo Zoom button at the top of the display.

Overlay

With the mouse in Trace Overlay mode, and two or more traces open, use the left mouse button to drag a trace from one window to another. To undo the trace overlay, select the Undo Trace Overlay button at the top of the display. Up to five plots can be overlaid.

Program Options

Select the Tools menu and select Program Options. The following display features can be turned on and off in this window.

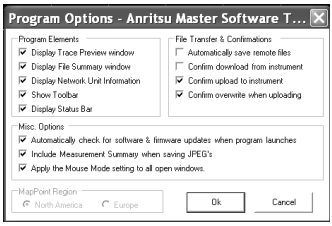

Figure 7-5. Program Options

Display Trace Preview Window

Shows selected measurement in the bottom left part of the display.

Display File Summary Window

Shows information about the file: File type, last saved, size, modified, location on the network or hard drive.

Display Network Unit Information

The unit will not show up on the network list if this option is deselected. To verify that unit shows or does not show up on the network, click on Network Unit Summary in the View window.

Show Toolbar

Allows selection to show toolbar in the top part of the display.

Display Status Bar

Allows selection to show the display bar.

Automatically Save Remote Files

Files downloaded from the instrument will automatically be saved to the local hard drive and placed in C:\Program Files\Anritsu\Anritsu Master Software Tools.

Confirm download from the Instrument

Display a message when download has been completed.

Confirm upload from the Instrument

Display a message when upload has been completed.

Confirm overwrite when uploading

Displays a message when files uploaded to the instrument are being overwritten.

Invert Colors when saving JPGs

Inverts the background color from black to white for better visibility.

Window

The Window menu allows various display options when there is more than one file open.

Cascade

Cascades all open measurement display windows.

Tile Horizontal
Tiles all open measurement display windows horizontally.

Tile Vertical
Tiles all open measurement display windows vertically.

Close All
Closes all open measurement display windows.

File
The File Menu allows the creation of new files and the saving of files.

> NOTE: File saving options can also be accessed by right clicking on an open measurement file.

New
Create new Signal Standard List.

Open
Opens a measurement file that has been saved in the local computer.

Save
Saves the currently open measurement to the PC hard disk or other selected PC storage device (floppy disk drive, etc.).

Save as
Saves the currently open measurement with a new file name

Save All
Save all open measurements

Export CSV
Exports measurements in .csv format.

Save JPG
Saves the file in jpg format.

Help
The Help menu provides access to the Help files and other documentation.

Help Contents
Shows the email and phone number for Anritsu support.

Anritsu on the web
Opens up the URL for the Anritsu homepage.

App Notes and Instruments Documentation
Download frequently used application notes and users guides.

Language Editor

The Language Editor allows for modification of the language already in the instrument (except English) and also provides the ability to add two custom languages to the instrument.

> NOTE: Special fonts for some languages must be installed on the system in order to edit those languages. Please contact your font vendor for specifics.

Modifying or Defining a Language

The standard language files provided in the instrument may be modified, except for the default English file. In addition, there are two Custom files, in English, that may be completely rewritten in another language if desired.

For most entries, there is a limit on message length due to the need to fit the message on a soft key or in a message box. The fonts used for the onscreen messages are proportional, meaning different characters can take different amounts of space. Some creativity may be necessary to fit the words into the allotted space. Ideally, the customized language message should not take up significantly more space than the English equivalent.

Always test the customized language by uploading it into the instrument and reviewing the menus to be sure the key labels fit in the available space and are fully discernible.

To modify a language file, select the Sync menu, select Download Language Table, and select System Language File.

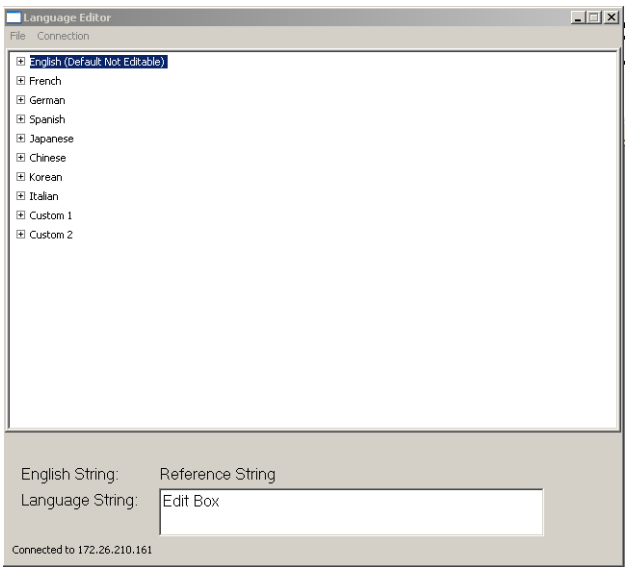

Figure 7-6. Language Editor Screen with a Language File Loaded

Select the language to be modified by clicking on the plus sign to the left of the language name. The file tree expands to show the three groups of labels available for editing.

Select the group of labels to be edited: Button Captions, Generic Text, or Parameter Names.

The figure below shows the groups and group labels under the Spanish language Parameter Name section, for example.

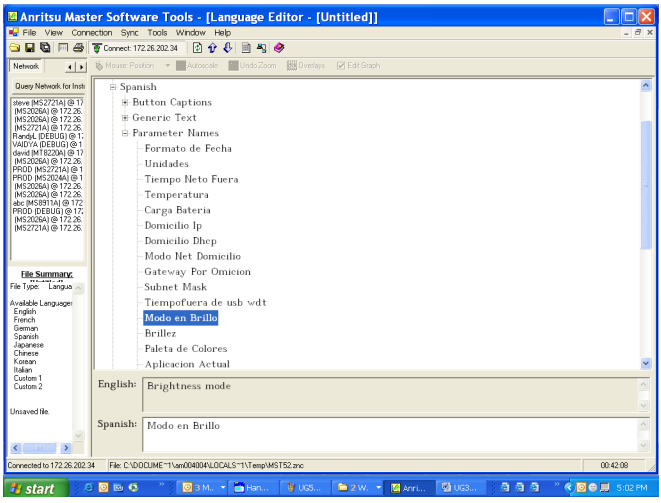

Figure 7-7. Master Software Tools Language Editor Parameter Names

To change the label of a parameter, click to select the Parameter to be changed and type the new text in the bottom window.

Save the modified language file to the PC hard disk, then upload it into the instrument.

NOTE: The files should be saved as vna.znc for the VNA language file, and system.znc for the system language file, before uploading to the instrument.

Signal Standards Editor

The Signal Standards Editor is a software application for viewing, editing and creating signal standards files. Select a signal standard entry from the list to make it active.

The Signal Standards Editor can:

- Create new signal standards files
- View and edit the signal standard definitions
- Copy and paste signal standard definitions
- Retrieve the signal standards file from a test unit
- Store an updated signal standards file back onto the test unit
- Generate a report of the signal standards file

Creating a New Signal Standards File

To create a new signal standards file, select New Signal Standards File from the File drop-down menu. An empty signal standards file will be displayed. To add a signal standard, select Add Signal Standard from the Edit menu.

To add an existing signal standard from a different signal standards file, use the Cut, Copy and Paste icons, or select Cut, Copy and Paste from the Edit menu.

Editing a Signal Standard

Open up the Signal Standard File to be edited.

Select Sync -> Download Signal Standards -> VNA Signal Standards to download the Signal Standard list from the instrument.

Select the Standard that is being edited.

Click on the plus sign and click on Segment1

Enter the new value in the text entry box under the main toolbar.

Save the file and upload it to the instrument.

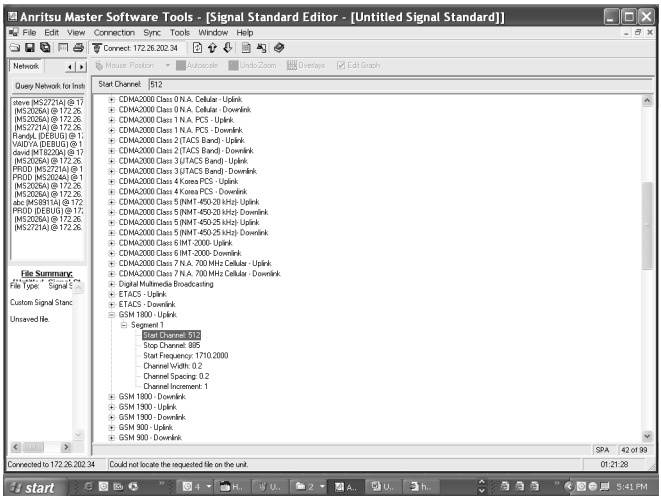

Figure 7-8. Signal Standard Editor

Cut, Copy and Paste

Use the Cut, Copy and Paste icons, or select Cut, Copy and Paste from the Edit menu to add, copy or remove signal standards. Cut moves the currently selected signal standard onto the clipboard and the signal standard is deleted from the Signal Standards list. If the signal standards file is saved, the cut signal standard will be permanently deleted from that list.

Copy puts a copy of the signal standard on the clipboard, but does not delete it from the current Signal Standards list.

Paste copies a signal standard from the clipboard into the current Signal Standards list.

Pass/Fail Mode

In UMTS Master Pass/Fail Mode is applicable to GSM/GPRS/EDGE and WCDMA/HSDPA modes. In GSM/GPRS/EDGE mode, several example test sets are stored in the unit. In the WCDMA/HSDPA mode, the UMTS Master stores the five test models specified in the 3GPP specification (TS 125.141) for testing base station performance and recalls those models for quick, easy measurements. When a test model is selected, the UMTS Master displays the test results in tabular format with clear PASS or FAIL indications that include min/max thresholds.

Using Master Software Tools, additional custom test list can be created and loaded into the UMTS Master. All critical parameters can be selected for pass/fail testing including the individual power level for each code, the spreading factor, and the symbol EVM.

Procedure

Step 1. In Master Software Tools, select File to open the file menu.

Step 2. Select New and Pass/Fail File then New WCDMA Pass/Fail to activate the custom list.

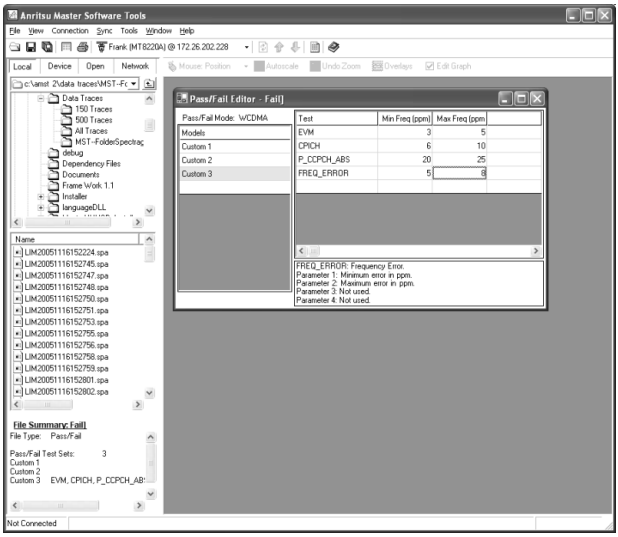

Figure 7-9. Master Software Tools Pass/Fail Editor

Step 3. Add the list name under Pass/Fail Mode WCDMA.

GSM/GPRS/EDGE and WCDMA/HSDPA test sets can also be created using Master Software Tools.

Step 4. Add the parameter and its min and max values.

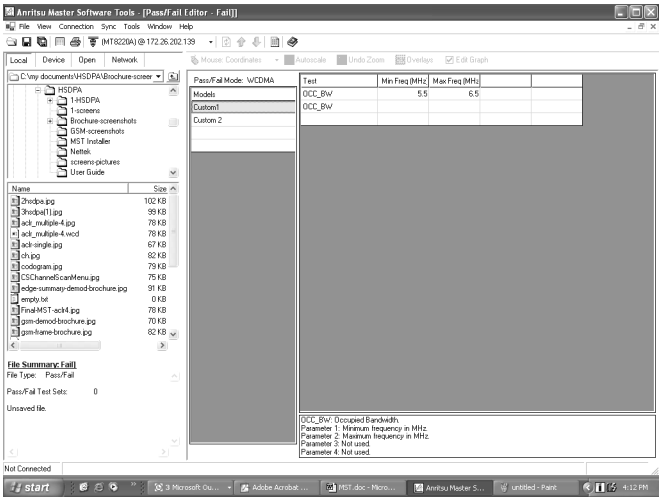

Figure 7-10.

Changing the Existing Test Model Parameters

Step 1. Select Sync to open the Sync menu, then Download Pass/Fail List and WCDMA Pass/Fail List. The software will download the WCDMA Pass/Fail list from the connected unit. The file can be edited and reloaded into the unit.

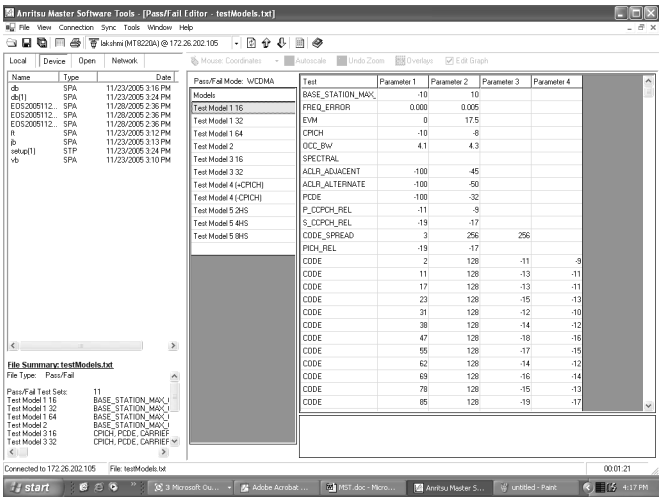

Figure 7-11.

NOTE: Follow same procedure to change existing GSM/GPRS/EDGE test set parameters.

Dat Conversion Utility

Introduction

This utility is used to convert saved traces (.dat files) from an Anritsu MS2711D, MS2711B, MT8212A, MT8212B, S332D, S332C, or S114C to the format used by Master Software Tools. This conversion is a one-way process as there is no equivalent utility to convert newer traces to the older format. The trace files in the old format are not deleted, and the new format uses a different file name extension, .vna instead of .dat. If necessary the old traces can still be used directly with the Handheld Software Tools program.

Procedure

Step 1. Open the Tools menu in Master Software Tools and select DAT File Conversion Tool.

Step 2. Start the Measurement Conversion Utility from the Master Software Suite menu.

Step 3. In the Source area at the top area of the window, navigate to the directory that contains the traces to be converted.

Step 4. In the Destination area, select the directory into which the converted traces are to be placed.

Step 5. Select the Conflicting Filenames option to be used – to keep existing, overwrite, prompt for a decision or skip the conversion of the file for which there is a conflict.

Step 6. Select the measurement or measurements to be converted.

Step 7. Click the Convert File button. Note that the new traces appear in the destination window.

NOTE: Before the conversion, select View to preview the file in the new format if desired.

Automatic Firmware Updates

Master Software Tools can be used to update the UMTS Master firmware and also to download available product information, such as Anritsu Application Notes.

The PC running Master Software Tools must be connected to the internet.

Procedure

Step 1. Open the Tools menu, then select Product Updates.

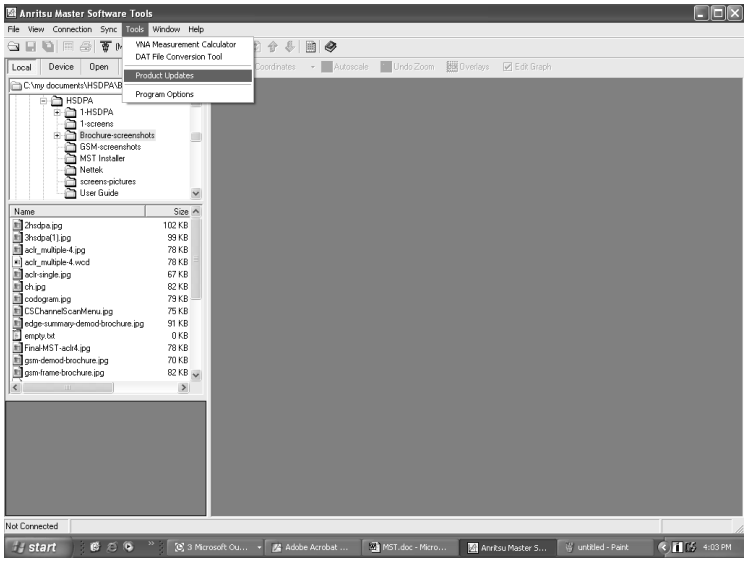

Figure 7-12. Product Updates Menu

The Product Updates window will open.

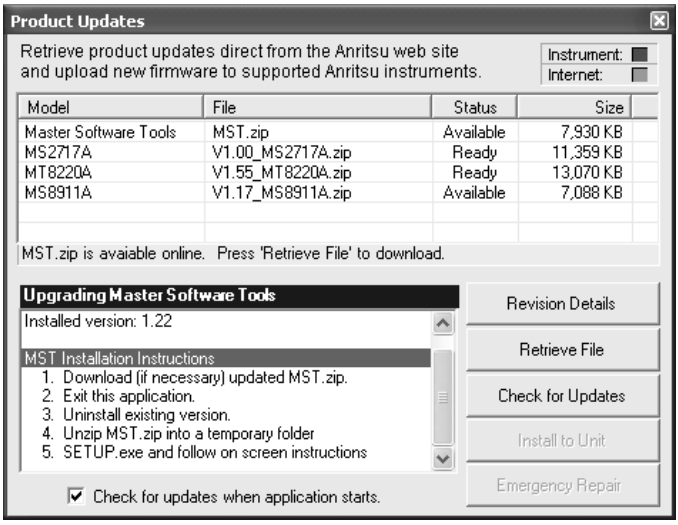

Figure 7-13. Product Updates Window

NOTE: Connection with the Internet has been established when the Internet indicator in the upper right corner of the window is green.

Step 2. Select the Check for Updates button. Master Software Tools will connect to the Anritsu web site and display information on the available update files.

NOTE: If “Check for updates when the application starts.” is checked, the software will automatically connect to the Anritsu web site and display the available updates when started.

Step 3. Select Retrieve File and follow the instructions to update the instrument.

Appendix A
Signal Standards

Introduction

This appendix provides a list of the signal standards included in the MS2717A. The standards displayed depend on the operating mode selected.

AMPS / EIA 553 - Uplink
C-450(P) - Uplink
C-450(P) - Downlink
C-450(SA) - Uplink
C-450(SA) - Downlink
CDMA China 1 - Uplink
CDMA China 1 - Downlink
CDMA China 2 - Uplink
CDMA China 2 - Downlink
CDMA Japan - Uplink
CDMA Japan - Downlink
CDMA Korea PCS - Uplink
CDMA Korea PCS - Downlink
CDMA US Cellular - Uplink
CDMA US Cellular - Downlink
CDMA US PCS - Uplink
CDMA US PCS - Downlink
CDMA2000 Class 0 Korea Cellular - Uplink
CDMA2000 Class 0 Korea Cellular - Downlink
CDMA2000 Class 0 N.A. Cellular - Uplink
CDMA2000 Class 0 N.A. Cellular - Downlink
CDMA2000 Class 1 N.A. PCS - Uplink
CDMA2000 Class 1 N.A. PCS - Downlink
CDMA2000 Class 2 (TACS Band) - Uplink
CDMA2000 Class 2 (TACS Band) - Downlink
CDMA2000 Class 3 (JTACS Band) - Uplink
CDMA2000 Class 3 (JTACS Band) - Downlink
CDMA2000 Class 4 Korea PCS - Uplink
CDMA2000 Class 4 Korea PCS - Downlink
CDMA2000 Class 5 (NMT-450-20 kHz)- Uplink
CDMA2000 Class 5 (NMT-450-20 kHz)- Downlink
CDMA2000 Class 5 (NMT-450-25 kHz)- Uplink
CDMA2000 Class 5 (NMT-450-25 kHz)- Downlink
CDMA2000 Class 6 IMT-2000- Uplink
CDMA2000 Class 6 IMT-2000- Downlink
CDMA2000 Class 7 N.A. 700 MHz Cellular - Uplink
CDMA2000 Class 7 N.A. 700 MHz Cellular - Downlink
DCS 1800 - Uplink
DCS 1800 - Downlink
Digital Multimedia Broadcasting
ETACS - Uplink
ETACS - Downlink
GSM 450 - Uplink
GSM 450 - Downlink

GSM 480 - Uplink
GSM 480 - Downlink
GSM 850 - Uplink
GSM 850 - Downlink
GSM 900 - Uplink
GSM 900 - Downlink
P-GSM 900 - Uplink
P-GSM 900 - Downlink
E-GSM 900 - Uplink
E-GSM 900 - Downlink
R-GSM 900 - Uplink
R-GSM 900 - Downlink
GSM 1800 - Uplink
GSM 1800 - Downlink
GSM 1900 - Uplink
GSM 1900 - Downlink
JTACS - Uplink
JTACS - Downlink
MATS-E - Uplink
MATS-E - Downlink
N-AMPS / IS-88L - Uplink
N-AMPS / IS-88L - Downlink
N-AMPS / IS-88M - Uplink
N-AMPS / IS-88M - Downlink
N-AMPS / IS-88U - Uplink
N-AMPS / IS-88U - Downlink
NADC IS136 Cellular - Uplink
NADC IS136 Cellular - Downlink
NADC IS136 PCS - Uplink
NADC IS136 PCS - Downlink
NMT-411-25kHz - Uplink
NMT-411-25kHz - Downlink
NMT-450-20kHz - Uplink
NMT-450-20kHz - Downlink
NMT-450-25kHz - Uplink
NMT-450-25kHz - Downlink
NMT-470-20kHz - Uplink
NMT-470-20kHz - Downlink
NMT-900 - Uplink
NMT-900 - Downlink
NMT-900(Offset) - Uplink
NMT-900(Offset) - Downlink
NTACS - Uplink
NTACS - Downlink
PCS 1900 - Uplink
PCS 1900 - Downlink
PDC 800 Analog - Uplink
PDC 800 Analog - Downlink
PDC 1500 (JDC) - Uplink
PDC 1500 (JDC) - Downlink
PHS - Uplink
PHS - Downlink
SMR 800 - 12.5 kHz - Uplink
SMR 800 - 12.5 kHz - Downlink

SMR 800 - 25 kHz - Uplink
SMR 800 - 25 kHz - Downlink
SMR 1500 - Uplink
SMR 1500 - Downlink
TACS - Uplink
TACS - Downlink
Digital Terrestrial TV Japan
Terrestrial TV Japan
Terrestrial TV USA
Terrestrial TV Eur. UHF-8MHz
UMTS Band I Uplink 9612-9888 Europe
UMTS Band I Downlink 10562-10838 Europe
UMTS Band II Uplink(General) 9262-9538 US
UMTS Band II Uplink(Additional) 12-287 US
UMTS Band II Downlink(General) 9662-9938 US
UMTS Band II Downlink(Additional) 412-687 US
UMTS Band III Uplink 8562-8913 Europe
UMTS Band III Downlink 9037-9388 Europe
UMTS Band IV Uplink(General) 8562-8763
UMTS Band IV Uplink(Additional) 1162-1362
UMTS Band IV Downlink(General) 10562-10763
UMTS Band IV Downlink(Additional) 1462-1662
UMTS Band V Uplink(General) 4132-4233 US
UMTS Band V Uplink(Additional) 782-782 US
UMTS Band V Downlink(General) 4357-4458 US
UMTS Band V Downlink(Additional) 1007-1007 US
UMTS Band VI Uplink(General) 4162-4188 Japan
UMTS Band VI Uplink(Additional) 812-837 Japan
UMTS Band VI Downlink(General) 4387-4413 Japan
UMTS Band VI Downlink(Additional) 1037-1062 Japan
802.11a
802.11b
802.11 FH
802.11 DS
802.11g

Appendix B
Error Messages

Introduction

This chapter provides a list of error messages that could be displayed on the MS2717A. If any error condition persists, contact your local Anritsu Service Center (page 1-11).

Self Test or Application Self Test Errors

Overall Status FAILED

One or more elements of the System or Application Self Test has failed. Refer to the other pass fail tests listed below to determine which specific test failed.

ADC Self Test FAILED

The Analog to Digital converter failed to return an answer. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

DDC FAILED

The Digital Down Converter failed to return a value. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Lock Test FAILED

One or more Phase Lock Loops Failed to properly achieve Lock Status. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Over Power FAILED

RF Power applied to the input connector is too high. Remove or reduce the input power or add additional attenuation. Sometimes out of band frequencies may be present that can cause an Over Power Error. In highly rich RF environments it may be necessary to add an external band pass filter to reduce unwanted interference. See the accessories section for a list of available band pass filters from Anritsu. Out of band frequencies can often be detected by increasing the Span to maximum in the peak detect mode of operation. Another resolution may be to reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Over Power Start FAILED

RF Power applied to the input connector is too high at turn on. See Over Power FAILED error above.

Mixer Saturation: Increase Attenuation

or

Mixer Overdrive FAILED

Too much power applied with too little Attenuation. Increase attenuation. Sometimes even out of band frequencies may be present that would cause a Mixer Overdrive Error. In highly rich RF environments it may be necessary to add an external band pass filter to reduce unwanted interference. See the accessories section for a list available band pass filters from Anritsu. Out of band frequencies can often be detected by increasing the SPAN to maximum in peak detect mode of operation. Another resolution may be to Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Operation Errors

ADC Over range: Increase Reference Level

Input signal is too large for the Analog to Digital converter to process. Increase the internal or external attenuation or, if using Auto attenuation, increasing the Reference Level should resolve the error. See also the Mixer Overdrive error above for information on Out of band RF power.

Calibrator Reading Error

Calibration reference source is not providing quality signal. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Fatal Error

Usually caused by a failure to communicate with one section or another. Sometimes resolved by restarting the unit or by Factory Defaults, ESC+ON, resetting of the unit. Under extreme cases the use of MASTER RESET, System+ON, may resolve the issue. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Trace not saved. Please wait for complete sweep and try again.

Attempted to save a measurement trace before the sweep had completed at least once. Wait for at least one complete sweep and try to save again.

Measurement not valid in Zero Span

Attempt was made to make a automated measurement that requires more than ZERO SPAN to accomplish. An example would be Occupied Bandwidth measurement.

The Freq range of the Antenna is invalid for this setup. Please select another Antenna

Choose a start and stop frequency that is within the defined frequency range for the selected antenna compensation table. See also Master Software Tools for creation and Upload of Antenna correction files.

Minimum permitted Sweep time is 50µs

An attempt was made to set the minimum Sweep time to less than 50us.

Invalid Attenuation for Preamp

The only valid attenuation settings while the Preamp is operational are 0dB and 10dB. All other settings attempted by the user will result in this message. Select 0dB or 10dB or select AUTO Attenuation to let the system determine the correct setting based on the reference level selected.

Valid Attenuations with Preamp on are 0dB and 10dB

Same as above

Unable to add additional limit points. %d is the maximum.

Attempted to add an additional limit line point beyond the maximum number of allowed points.

Use Demod type USB or LSB to use Beat Frequency Osc

An attempt to use the Beat Frequency Oscillator while not in Upper or Lower Sideband Demodulation mode.

Trace A/B/C has no data to view

Attempt to turn on or VIEW a trace that has never had data recalled into this trace location. Refer to RECALL TRACE section for instructions on how to recall stored measurement traces into either Trace A, B or C.

DSP Memory Failure, Address, Ext High, Ext Middle, Ext low, Ext1, Ext2

One of the DSP memory locations has failed. The DSP will attempt to resolve the memory Failure location and Byte. There are two external memory banks (Ext1 = bank one, Ext2 = Bank 2) with three bytes wide (Ext High, Ext Middle and Ext Low. Byte)

Locking to Internal Ref failed

Switching from an external frequency reference to the internal reference has failed. Some additional warm up time may be needed if the unit has been on external reference for a long time or the unit is not warmed up enough.

Locking to External Ref failed Lock attempt Failed

Switching from an internal frequency reference to the external reference has failed. verify that the correct external reference frequency value has been selected from the list of valid external reference frequencies. Verify that the level of the external reference frequency is at least 1vp-p.

EEPROM TEST: FAIL

Hardware communications between modules has failed. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

EEPROM TEST: UNKNOWN ERROR

Hardware communications between modules has failed. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Fatal error, Unknown

Hardware communications between modules has failed. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Fatal error, EEPROM failed

Hardware communications between modules has failed. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all

user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Fatal error, no SPA board connected

Hardware communications between modules has failed. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Fatal error not decoded by DSP

Hardware communications between modules has failed. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

UNKNOWN ERROR In SPA

Hardware communications between modules has failed. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

DSP version different from released version

May occur during firmware update. Likely cause is incomplete firmware package installation. Finish complete firmware update with Master Code Loader.

Operation not Permitted in Recall Mode

Attempted to perform an operation on a recalled trace. Many operations are valid only on a live or active trace.

Cannot change scale in Linear mode

Linear display mode of operation does not support a scaling change like the Log display mode.

Cannot turn on delta marker because Ref Marker is invalid

Delta markers cannot be enabled unless the primary marker is within the displayed span.

Cannot turn on delta marker because Ref Marker is a counter Marker

Delta markers cannot be enabled unless the primary marker is is NOT a counter Marker. Turn off the Counter Marker mode of marker operation to use Delta Marker.

Current Marker is not ON

Attempted to use a marker mode or feature for a marker that is not enabled. Turn on the appropriate marker to use this function or switch to a marker that is already enabled.

Marker must be ON to Use the feature

Attempted to use a marker mode or feature for a marker that is not enabled. Turn on the appropriate marker to use this function or switch to a marker that is already enabled.

Triggering valid only in Zero Span

External triggering can only be used while the SPAN is set to 0 (zero)

Cannot change Modes for Recalled/Inactive Traces

Detection modes or other elements like RBW/VBW, averaging etc. cannot be altered on a recalled trace. The trace is displayed with the same parameters in which it was saved.

Cannot change average for Recalled/Inactive Traces

Cannot set Delta Detection modes or other elements like RBW/VBW, averaging etc. cannot be altered on a recalled trace. The trace is displayed with the same parameters in which it was saved.

Pretune Calibration Failure

Pretune Result Warning

Pretune Calibration Table fault.

Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Lock failed during initialization

One or more of the Phase Lock Loops failed to acheive lock status during startup. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Reference LVL Cal is OFF

Factory Calibration is OFF. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

IF Cal is OFF

Factory Calibration is OFF. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Lock failure

One or more of the Phase Lock Loops cannot keep the frequency controlled accurately. Insure that the temperature is within acceptable limits. Reset to factory defaults with either Factory Defaults, ESC+ON, or MASTER RESET, System+ON. Caution: Use of MASTER RESET, System+ON, will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Cannot set Delta Mkr Freq to Demod Freq

Marker to Demod frequency is only available with a primary marker as the selected marker.

High Temp Warning

The internal temperature has reached an excessive level, 85ºC. Verify that the ventilation openings are unobstructed and that the fan is running. Internal temperatures may be manually verified by using the SELF TEST function. Turn off the unit and allow the temperature to cool down. If the fault is not resolved and the internal temperature reaches 90ºC, a countdown of 10 seconds will begin to give the user a chance to save the current setup before it will turn itself off before internal temperatures can cause any damage. If the error persists after removing any obstructions and allowing the unit to cool, reset to the factory defaults with either Factory Defaults, ESC+ON. Caution: Use of MASTER RESET, System+ON,

will erase all user saved setups and measurement traces and return the unit to a fully Factory Default condition. If the error persists, contact your Anritsu Service Center.

Copy failed. Please check External Card

Attempt to copy user saved data to external the Compact Flash Card has failed. Do not attempt to remove or power down the unit before the copy has completed. Be sure that the CF is not already full and that it is fully inserted into the CF-Card slot.

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