User Guide

Spectrum Master™

MS2720T

High Performance Handheld Spectrum Analyzer

Appendix A provides a list of supplemental documentation for the Spectrum Master features and options. The documentation set is available as PDF files on the documentation disc and the Anritsu website.

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Chapter 1 — General Information

1-1   Introduction

The Spectrum Master user guide is part of a set of manuals that cover all of the instrument functions and their use. This manual covers the instrument overview, system functions, and other common features, along with a brief guide to basic measurement concepts and setups. Most instrument operations and modes are covered in specific measurement guides as listed below.

Additional Documentation

Document Part Number	Description (Required Option)
10100-00065	Important Product Information, Compliance and Safety Notices
10580-00349	Spectrum Analyzer Measurement Guide Spectrum Analyzer (709, 713, 720, 732, or 743) IQ Waveform Capture (24) Interference Analyzer (25) Channel Scanner (27) Zero-Span IF Output (89) Gated Sweep (90) Coverage Mapping (431) EMF Measurements (444) AM/FM/PM Analyzer (509)
10580-00339	Tracking Generators Measurement Guide Tracking Generator (809, 813, or 820)
10580-00240	Power Meter Measurement Guide High-Accuracy Power Meter (19)
10580-00236	WiMAX Signal Analyzer Measurement Guide IEEE 802.16 WiMAX Fixed and Mobile Signal Analyzer (885)
10580-00235	3GPP2 Signal Analyzer Measurement Guide CDMA2000 1X and EV-DO Signal Analyzer (884)
10580-00234	3GPP Signal Analyzer Measurement Guide GSM/GPRS/EDGE Signal Analyzer (880) W-CDMA/HSPA+ Signal Analyzer (881) TD-SCDMA/HSPA+ Signal Analyzer (882) LTE/LTE-A (FDD and TDD) Signal Analyzer (883)

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

- http://www.anritsu.com/en-US/test-measurement/products/ms2720t

Contacting Anritsu for Sales and Service

To contact Anritsu, visit the following URL and select the services in your region:
http://www.anritsu.com/contact-us.

1-2   Instrument Description

The Spectrum Master is a synthesizer-based handheld spectrum analyzer that provides quick and accurate measurement results. Measurements can be easily made by 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 over 1000 measurement setups and up to 1000 traces. External storage can be used for bulk measurement storage. The bright daylight-viewable, high-resolution, color liquid crystal display (LCD) provides easy viewing in a variety of lighting conditions. The Spectrum Master is capable of up to 3 hours of continuous operation from a fully charged battery and can be operated from a 12 VDC source, which also simultaneously charges the battery.

The Spectrum Master is designed for monitoring, measuring, and analyzing signal environments. Typical measurements include: in-band interference and transmit spectrum analysis, plus cell site and 802.11a/b/g interference testing. Options are available for RF, advanced demodulation, and over-the-air (OTA) measurement. 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 a limit value is exceeded.

In CDMA demodulation options, the Spectrum Master displays six markers and the marker table in Code Domain Power and Codogram displays. In Spectrum Analyzer mode, a full range of marker capabilities is provided. Markers are not available in GSM mode.

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

Measurements may be stored in internal memory, on a USB flash drive, or a FAT32-formatted external disk. Stored measurements can be downloaded to a PC by using the included USB and Ethernet cables. After being stored, the graphic trace can then be displayed, scaled, or enhanced with markers and limit lines. Historical graphs can be overlaid with current data by using the PC mouse in drag-and-drop fashion. The underlying data can be extracted and used in spreadsheets or for other analytical tasks.

Note	Not all USB drives are compatible with the instrument. Many drives come with a second partition that contains proprietary firmware. This partition must be removed. Only one partition is allowed. Refer to the individual manufacturer for instructions on how to remove it. Some drives can be made to work by reformatting them using the FAT32 format.

Available Models

Table 1-1 lists the Spectrum Master frequency options that are described in this User Guide.

Table 1-1.   Spectrum Master Frequency Options

Model	Frequency Range
MS2720T-0709	Spectrum Analyzer, 9 kHz to 9 GHz
MS2720T-0713	Spectrum Analyzer, 9 kHz to 13 GHz
MS2720T-0720	Spectrum Analyzer, 9 kHz to 20 GHz
MS2720T-0732	Spectrum Analyzer, 9 kHz to 32 GHz
MS2720T-0743	Spectrum Analyzer, 9 kHz to 43 GHz
MS2720T-0809	9 GHz Tracking Generator[a]
MS2720T-0813	13 GHz Tracking Generator[a]
MS2720T-0820	20 GHz Tracking Generator[a]

a. Tracking Generator frequency must match instrument hardware frequency option. For example, MS2720T-0813 is an option for MS2720T-0713.

Available Options

Available options for the Spectrum Master are listed in Table 1-2.

Table 1-2.   Available Options

Option	Description
MS2720T-0001	Atomic Clock[a]
MS2720T-0007	Secure Data Operation
MS2720T-0009	I/Q Demodulation Hardware
MS2720T-0019	High-Accuracy Power Meter (sensor not included)
MS2720T-0024	I/Q Waveform Capture[b]
MS2720T-0025	Interference Analyzer
MS2720T-0027	Channel Scanner
MS2720T-0031	GPS Receiver (Requires GPS Antenna 2000-1528-R or 2000-1652-R)
MS2720T-0089	Zero-Span IF Output
MS2720T-0090	Gated Sweep
MS2720T-0431	Coverage Mapping (requires Option 31)
MS2720T-0444	EMF Measurement (Requires Anritsu Isotropic Antenna)
MS2720T-0509	AM/FM/PM Analyzer
MS2720T-0880	GSM/GPRS/EDGE RF Demodulation[c]
MS2720T-0881	W-CDMA/HSDPA Measurements[c]
MS2720T-0882	TD-SCDMA/HSDPA Measurements[c]
MS2720T-0883	FD and TD LTE/LTE-A Measurements[c]
MS2720T-0884	CDMA2000 1xEV-DO Measurements[c]
MS2720T-0885	WiMAX Fixed/Mobile Measurements[c]
MS2720T-0098	Standard Calibration to Z540
MS2720T-0099	Premium Calibration to Z540 plus test data

a. Not compatible with CDMA, Option 884 for PN code measurements. This option also cannot be combined with Options 809, 813, 820, 732, or 743.

b. Option 9 is required, I/Q Demodulation Hardware.

c. Option 9 is required, and Option 31 is recommended (GPS Receiver).

1-3   Calibration and Verification

Anritsu recommends an annual calibration and performance verification of the Spectrum Master by local Anritsu service centers. The Spectrum Master is self-calibrating and there are no field-adjustable components. Contact information for Anritsu Service Centers is available at: http://www.anritsu.com/contact-us.

1-4   Instrument Care and Preventive Maintenance

Site Master care and preventive maintenance consists of cleaning the unit and inspecting and cleaning the RF connectors on the instrument and all accessories. Clean the Site Master 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.

Connector Care

Clean the RF connectors and center pins with a cotton swab dampened with denatured alcohol. Visually inspect the connectors. The fingers of the N(f) connectors and the pins of the N(m) connectors should be unbroken and uniform in appearance. If you are unsure whether the connectors are undamaged, gauge the connectors to confirm that the dimensions are correct. Visually inspect the test port cable(s). The test port cable should be uniform in appearance, and not stretched, kinked, dented, or broken.

To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the Type-N connectors. The recommended torque is 12 lbf ·in to 15 lbf ·in (1.36 N ·m to 1.70 N ·m). Inadequate torque settings can affect measurement accuracy. Over-tightening connectors can damage the cable, the connector, the instrument, or all of these items.

Visually inspect connectors for general wear, cleanliness, and for damage such as bent pins or connector rings. Repair or replace damaged connectors immediately. Dirty connectors can limit the accuracy of your measurements. Damaged connectors can harm the instrument. Connection of cables carrying an electrostatic potential, excess power, or excess voltage can damage the connector, the instrument, or both.

Connecting Procedure

1. Carefully align the connectors. The male connector center pin must slip concentrically into the contact fingers of the female connector.

2. Push connectors straight together. Do not twist or screw them together. A slight resistance can usually be felt as the center conductors mate.

3. To tighten, turn the connector nut, not the connector body. Major damage can occur to the center conductor and to the outer conductor if the connector body is twisted.

4. If you use a torque wrench, initially tighten by hand so that approximately 1/8 turn or 45 degrees of rotation remains for the final tightening with the torque wrench.

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

   Do not over-torque the connector.

Disconnecting Procedure

1. If a wrench is needed, use an open-end wrench to keep the connector body from turning while loosening with a second wrench.

2. Complete the disconnection by hand, turning only the connector nut.

3. Pull the connectors straight apart without twisting or bending.

ESD Caution

The Site Master, like other high performance instruments, is susceptible to electrostatic discharge (ESD) damage. Coaxial cables and antennas often build up a static charge, which (if allowed to discharge by connecting directly to the Site Master without discharging the static charge) may damage the Site Master input circuitry. Site Master operators must 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. Because these apply to the Site Master, it is recommended that any static charges that may be present be dissipated before connecting coaxial cables or antennas to the Site Master. This may be as simple as temporarily attaching a short or load device to the cable or antenna prior to attaching to the Site Master. 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.

Battery Replacement

The battery can be replaced without the need for any tools. The battery compartment is located on the lower left side of the instrument, with the measurement display facing you. Slide the battery door down, towards the bottom of the instrument. To remove the battery pack, pull straight out on the battery lanyard.
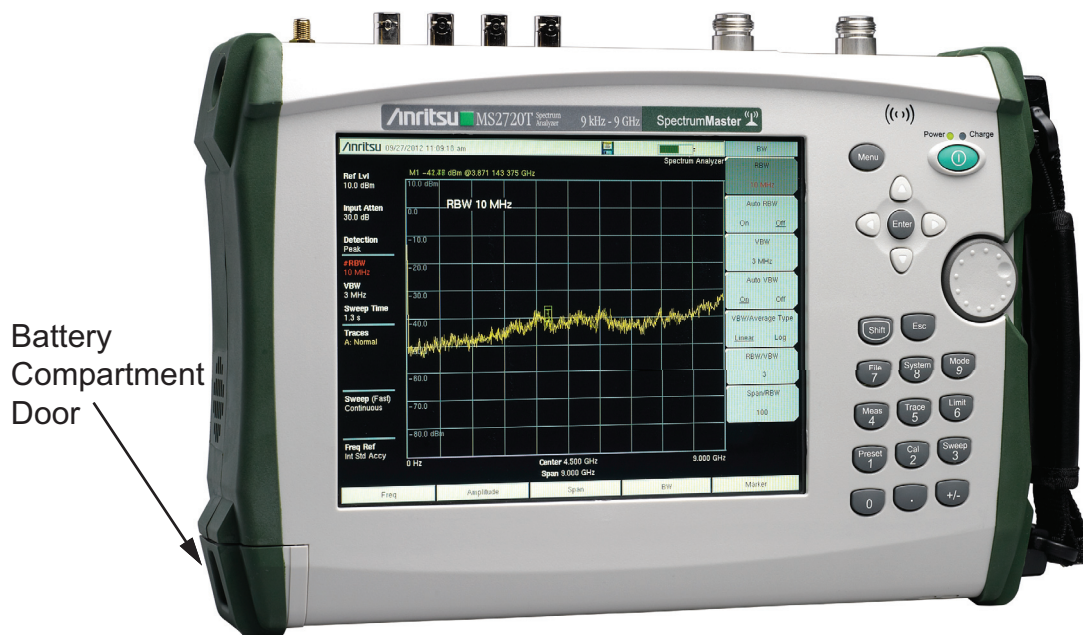
Figure 1-1.   Battery Compartment Door

Warning	To avoid damage, use only Anritsu approved batteries, adapters, and chargers with this instrument.

The battery that is supplied with the Spectrum Master may need charging before use. The battery can be charged while it is installed in the Spectrum Master by using either the AC Adapter or the 12-Volt DC adapter, or separately in the optional Dual Battery Charger. Refer to section "Symbols and Indicators" on page 2-24 for a description of battery symbols.

Caution	When using the Automotive Adapter, always verify that the supply is rated for a minimum of 60 Watts at 12 VDC, and that the socket is clear of any dirt or debris. If the adapter plug becomes hot to the touch during operation, then discontinue use immediately.

Note	Anritsu recommends removing the battery for long-term storage of the instrument.

Chapter 2 — Instrument Overview

2-1 Introduction

This chapter provides a brief overview of the Anritsu MS2720T Spectrum Master. The intent of this chapter is to acquaint you with the instrument. To begin using the instrument immediately, go to Chapter 3, "Initial Startup", to find directions for power on, editing, frequency, bandwidth, amplitude, limit line, marker, file management procedures, and firmware update. For more detailed information on measurement setups, refer to the specific measurement guides, which are based on the options that can be purchased for this instrument. The spectrum analyzer is not an option, but it has a measurement guide. The measurement guides and a copy of this user guide are available as PDF files on the Documentation disc or the Anritsu web site (http://www.anritsu.com). Refer to Appendix A, "Related Documents".

2-2   Hardware Overview

Turning On the MS2720T for the First Time

The Anritsu MS2720T Spectrum Master is capable of approximately 3 hours of continuous operation from a fully charged, field-replaceable battery (refer to "Battery Replacement" on page 1-7 of Chapter 1). The MS2720T can also be operated from a 12 VDC source (which will also simultaneously charge the battery). This can be achieved with either the Anritsu AC Adapter or Automotive Adapter. Both items are included as standard accessories.

Caution	When using the Automotive Adapter, always verify that the supply is rated for a minimum of 60 Watts at 12 VDC and that the socket is clear of any dirt or debris. If the adapter plug becomes hot to the touch during operation, then discontinue use immediately.

To turn on the MS2720T, press the **On/Off** button on the front panel (Figure 2-1).
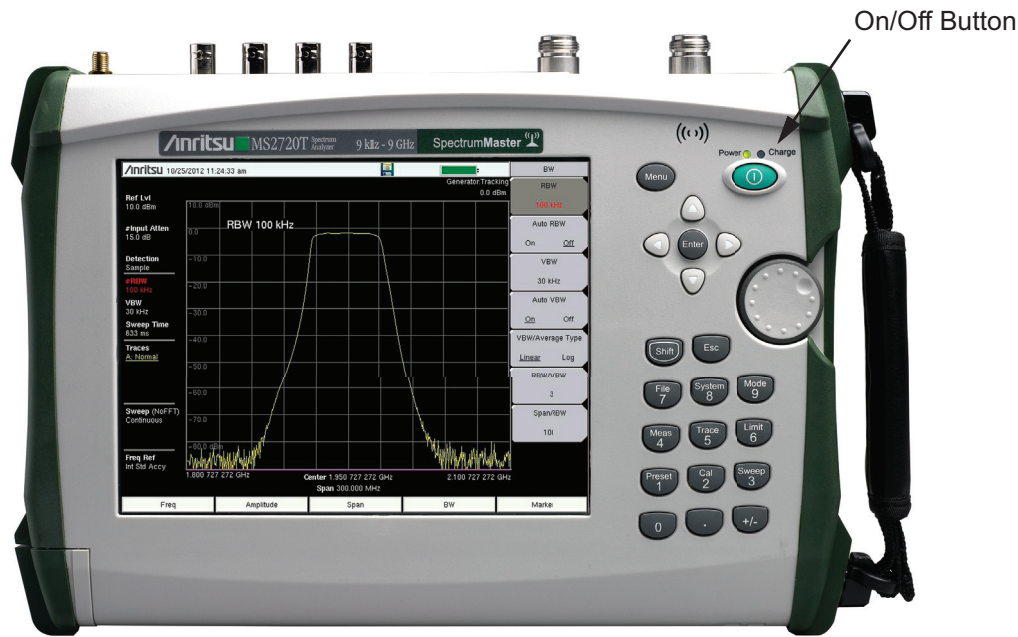
Figure 2-1.   MS2720T On/Off Button

The MS2720T Spectrum Master takes approximately 50 seconds to complete power-up and to load the application software. At the completion of this process, the instrument is ready to be used.

2-3   Test Panel Connectors

The test connector panel shown in Figure 2-2 is for the lower frequency options (up to 20 GHz) that also have the Tracking Generator option available. The connectors are described in the following text. Note that the Tracking Generator option is not installed and that its connector space is protected with a blank cover.
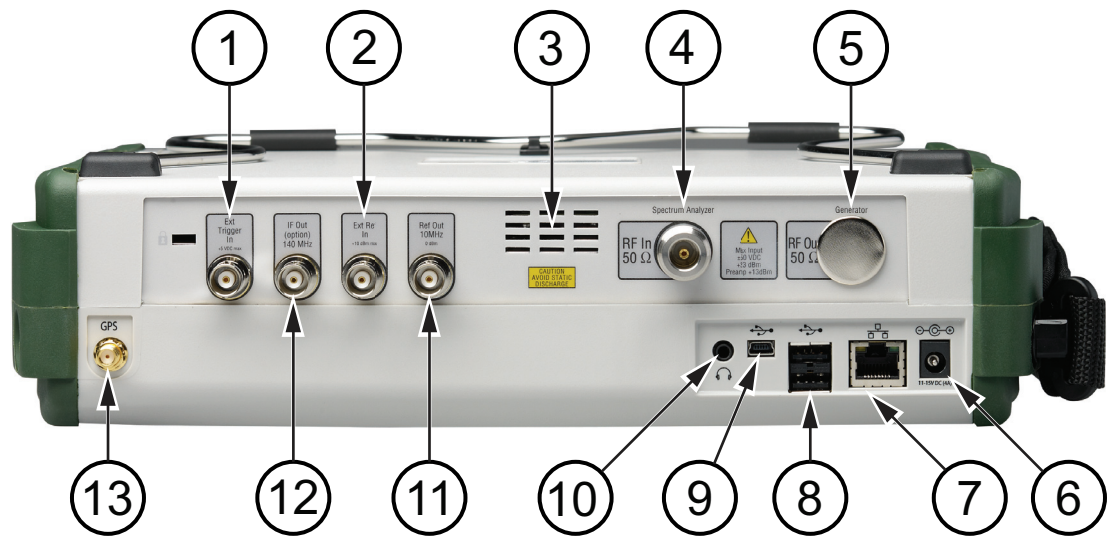
Figure 2-2.   Test Panel Connectors for MS2720TOptions 709, 713, 720

1.	External Trigger In Connector
2.	External Reference In Connector
3.	Fan Exhaust Port
4.	Spectrum Analyzer RF In Port, Type N Connector
5.	Location for Optional Tracking Generator RF Out, Type N Connector
6.	External Power Connector
7.	LAN Connection
8.	USB Interface, Type A
9.	USB Interface, Type Mini-B
10.	Headset Jack
11.	Reference Out Connector, 10 MHz
12.	IF Out Connector, 140 MHz (Option 89)
13.	GPS Antenna Connector

The test connector panel shown in Figure 2-3 is for the two higher frequency options (32 GHz and 43 GHz). The connectors are described in the following text.
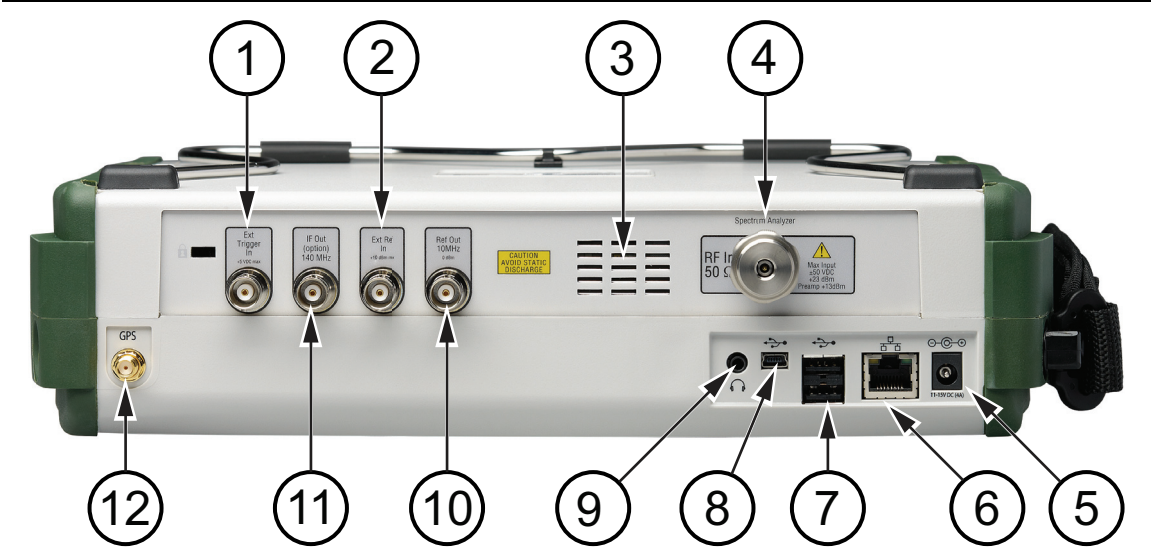
Figure 2-3.   Test Panel Connectors for MS2720TOptions 732, 743

1.	External Trigger In Connector
2.	External Reference In Connector
3.	Fan Exhaust Port
4.	Spectrum Analyzer RF In Port, Ruggedized Type K Connector
5.	External Power Connector
6.	LAN Connection
7.	USB Interface, Type A
8.	USB Interface, Type Mini-B
9.	Headset Jack
10.	Reference Out Connector, 10 MHz
11.	IF Out Connector, 140 MHz (Option 89)
12.	GPS Antenna Connector

Ext Trigger In

A TTL signal that is applied to the External Trigger 50 Ω female BNC input connector causes a single sweep to occur. In the Spectrum Analyzer mode, it is used in zero span, and can be used to cause triggering to occur on the selected edge of the signal, either rising or falling. After the sweep is complete, the resultant trace is displayed until the next trigger signal arrives. To prevent damage to your instrument, do not use pliers or a wrench to tighten the BNC connector.

Ext Ref In

The External Reference In port is a 50 Ω BNC female connector that provides for input of an external frequency reference. Refer to your Technical Data Sheet for valid frequencies. To prevent damage to your instrument, do not use pliers or a wrench to tighten the BNC connector.

RF In

This is a 50 Ω Type-N female connector (MS2720T-0709, MS2720T-0713, MS2720T-0720). To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the Type-N connector. Do not overtighten the connector. The recommended torque is 12 lbf ·in to 15 lbf ·in (1.36 N ·m to 1.70 N ·m).

Type K Connectors (for options MS2720T-0732, MS2720T-0743)

The higher frequencies require the Type K connector. It is a 50 Ω Type-K male ruggedized connector (MS2720T-0732, MS2720T-0743). To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the K connector. Do not overtighten the connector. The recommended torque is 8 lbf ·in (0.9 N ·m or 90 N ·cm).

Tracking Generator RF Out

This is a 50 Ω Type N female connector (MS2720T-0809, MS2720T-0813, MS2720T-0820). To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the Type-N connector. The recommended torque is 12 lbf ·in to 15 lbf ·in (1.36 N ·m to 1.70 N ·m).

External Power

This is a 2.1 mm by 5.5 mm barrel connector, 12 to 15 VDC, < 5.0 A. The external power connector is used to power the unit and for battery charging. A green flashing indicator light near the power switch shows that the instrument battery is being charged by the external charging unit. The indicator is steadily illuminated when the battery is fully charged.

Warning	When using the AC Adapter, always use a three-wire power cable that is connected to a three-wire power line outlet. If power is supplied without grounding the equipment in this manner, then the user is at risk of receiving a severe or fatal electric shock.

Refer also to the use of the Power–On submenu key () when controlling the Spectrum Master via external power and to .

LAN Connection

The RJ48C connector is used to connect the Spectrum Master to a local area network (LAN). Integrated into this connector are two LEDs. The amber LED shows the presence of a 10 Mbit/s LAN connection when On, and a 100 Mbit/s LAN connection when Off. The green LED flashes to show that LAN traffic is present. For additional information about the LAN connection, Ethernet connection, and DHCP, refer to Appendix D, "LAN and DHCP".

USB Interface – Type A

The MS2720T Spectrum Master can also be a USB Host and allow various USB Flash Memory devices and power sensors to be connected to the instrument for storing measurements, setups, and files.

USB Interface – Type Mini-B

The 5-pin mini-B USB 2.0 interface can be used to connect the MS2720T Spectrum Master directly to a PC. The first time the MS2720T is connected to a PC, the normal USB device detection by the computer operating system will take place. The CD-ROM that shipped with the instrument contains a driver for Windows XP and Windows 7 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.

Note	For proper detection, Master Software Tools should be installed on the PC prior to connecting the Spectrum Master to the USB port.

Headset Jack

The 3-wire headset jack provides audio output from the built-in AM/FM/SSB demodulator and from other sounds generated by the instrument. The jack accepts a 3.5 mm 3-wire miniature phone plug such as those commonly used with cellular telephones.

Ref Out 10 MHz

The External Reference Out port is a 50 Ω BNC female connector that provides 10 MHz at approximately 0 dBm. To prevent damage to your instrument, do not use pliers or a wrench to tighten the BNC connector.

IF Out 140 MHz (Option 89)

This 50 Ω BNC connector is for Zero Span 140 MHz IF Output with Option 89. To prevent damage to your instrument, do not use pliers or a wrench to tighten the BNC connector.

GPS Antenna Connector (Option 31)

The GPS antenna connection on the Spectrum Master is type SMA(F). Selectable +3 VDC or +5 VDC antenna power. To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the SMA connector. Do not overtighten the connector. The recommended torque is 8 lbf ·in (0.9 N ·m or 90 N ·cm).

2-4   Connector Care

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

Torque values are written as (for example) 12 lbf ·in to 15 lbf ·in (1.36 N ·m to 1.70 N ·m), where "lbf ·in" means pounds(force) inches or "inch pounds of force", and "N ·m" means "Newton meters of force".

Connecting Procedure

1. Carefully align the connectors.

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

2. Push connectors straight together. Do not twist or screw them together.

3. To tighten, turn the connector nut, not the connector body. Major damage can occur to the center conductor and to the outer conductor if the connector body is twisted.

4. If you use a torque wrench, then initially tighten by hand so that approximately 1/8 turn or 45 degrees of rotation remains for the final tightening with the torque wrench.

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

Do not over torque the connector.

Disconnecting Procedure

1. If a wrench is needed, then use an open-end wrench to keep the connector body from turning while loosening with a second wrench.

2. Complete the disconnection by hand, turning only the connector nut.

3. Pull the connectors straight apart without twisting or bending.

2-5   Front Panel Overview

The Spectrum Master menu-driven interface is easy to use and requires little training.
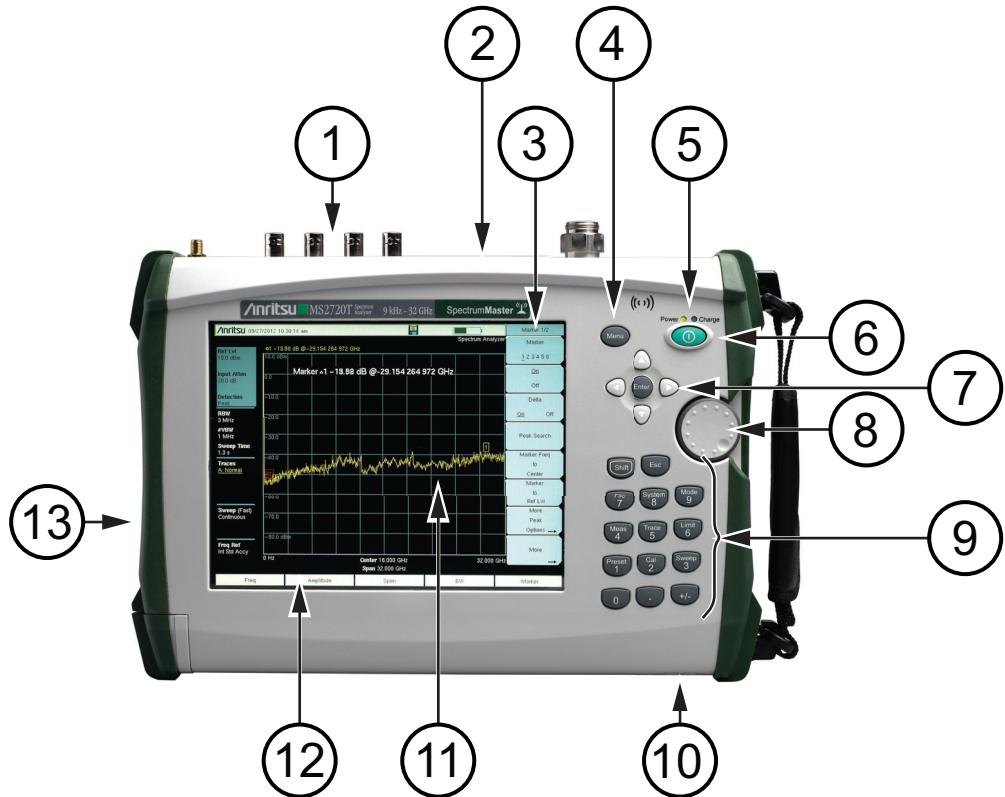
Figure 2-4.   Front Panel Overview

1.	Connector Panel
2.	Fan Exhaust Port
3.	Submenu Keys (Active Menu or Active Function Block)
4.	Menu Button
5.	Power LED and Battery Charge LED
6.	On/Off Button
7.	Enter Key and Arrow Keys
8.	Rotary Knob
9.	Number Keypad (includes Shift and Esc)
10.	Fan Inlet Port
11.	Measurement Display or Sweep Window
12.	Main Menu Keys
13.	Fan Exhaust Port

Graphical User Interface (GUI)

The measurement display, or sweep window, provides measurement trace data. Above the grid and trace data, additional measurement data is displayed, and the analyzer mode is shown in the top-right corner. The lower area of the grid may be reduced in size to display an optional data window, such as a table of measurement data or marker data. To the left of the grid and trace data is the instrument settings summary, below are the five main menu touch keys, and to the right are the submenu touch keys.

The main menu keys and the submenu keys are available in all analyzer modes. In addition, you can touch other areas of the display screen to perform tasks that are also available from the menu keys. Refer to "Touch Screen" on page 2-11.

Front Panel Hardware

A rotary knob and buttons (hard keys) are located to the right of the measurement display. See Figure 2-4. Ten of the hard keys (0 through 9) are dual purpose, depending upon the current mode of operation, and these dual-purpose keys (0 through 9) are labeled with a number on the key itself and the alternate function printed above each number. Use the **Shift** key to access the alternate functions that are printed on these keys. For example, use the **Shift** key plus the **0** (zero) key for "Touch Screen Calibration", which is described on page 2-16. The Escape key (**Esc**) is used for aborting data entry and is located beside the **Shift** key, just above the numbered keys. The rotary knob, the four **Arrow** keys, and the keypad can be used to change the value of an active parameter.

Battery Charge LED (Green)

The Battery Charge LED (item 5 in Figure 2-4) is located toward the right edge of the **On/Off** button. It remains on steady when the battery is fully charged, and blinks slowly when the battery is charging.

Power LED (Green)

The Power LED (item 5 in Figure 2-4) is located toward the left edge of the **On/Off** button. It remains on steady when the Spectrum Master is on, and blinks slowly when the Spectrum Master is off but has external power. Refer to "External Power On" on page 3-11.

Fan Inlet and Exhaust Ports

Keep the fan inlet and exhaust ports (items 2, 10, and 13 in Figure 2-4) clear of obstructions at all times. This is important for proper ventilation and cooling of the instrument. For port locations, see Figure 2-4.

Connector Panel

The top panel of connectors is described in Section 2-3 "Test Panel Connectors" on page 2-3. Recommendations for use and care of the connectors are described in "Connector Care" on page 2-7.

Front Panel Keys

See Figure 2-4 on page 2-8. The term hard key refers to each of the buttons on the instrument front panel, but not for the touch button images on the display screen (the submenu touch keys, the main menu touch keys, and icons that are provided for touch screen navigation). The front panel keys perform as follows:

Menu Key

Press this key (item 4 in Figure 2-4) to display shortcut icons for the installed instrument modes and also for any additional shortcuts that have been added by a user of the instrument. Refer to "Menu Key" on page 2-13.

Enter Key

Press this key (item 7 in Figure 2-4) to finalize data input.

Arrow Keys

The four arrow keys (item 7 in Figure 2-4) are used to scroll up, down, left, or right. Depending upon instrument mode and measurement selection, the arrow keys can often be used to change a value or to change a selection from a list. This function is similar to the function of the rotary knob. In some measurements, the **Left/Right** arrow keys change values by different increments than the **Up/Down** arrow keys or the rotary knob. The arrow keys also can be used to move markers.

Rotary Knob

Turn the rotary knob (item 8 in Figure 2-4) to change numerical values, to scroll through selectable items within a list, and to move markers. Values or items may be within a dialog box or an edit window.

Shift Key

Press the **Shift** key (item 9 in Figure 2-4) and then press a number key to open the menu that is printed above the number. Press **Shift** then **0** (zero) for "Touch Screen Calibration", which is described on page 2-16. Press three keys, **Shift**, then **Decimal**, then **+/−**, to save a JPEG image of the current display screen. The file name will be based on the current date and time. The file is always saved to the root directory of the internal memory, unless the instrument has Option 7 installed, in which case the file gets saved to the first USB drive, again in the root directory.

When the **Shift** key is active, its icon is displayed at the top-right corner of the measurement display area between the battery charge indicator and the submenu label.

Figure 2-5.   Shift Key Icon

Esc Key

Press this key to cancel any setting that is currently being made.

Number Keypad

Press these keys (item 9 in Figure 2-4) to directly input numbers, including a decimal point. A secondary function of the number keys opens menus. Refer to the functions of the "Shift Key".

Decimal Key

Press this key when entering decimal values.

+/− Key

Press this key to change the sign of numbers that are entered with the number keys. Press three keys, **Shift**, then **Decimal**, then **+/−**, to save a JPEG image of the current display screen.

2-6   Touch Screen

The touch screen and keypad are used for data entry. The sweep window and surrounding screen areas provide measurement information.

Graphical User Interface (GUI)

The measurement display, or sweep window, provides measurement trace data. Above the grid and trace data, additional measurement data is displayed, and the analyzer mode is shown in the top-right corner. The lower area of the grid may be reduced in size to display an optional data window, such as a table of measurement data or marker data. To the left of the grid and trace data is the instrument settings summary, below are the five main menu touch keys, and to the right are the submenu touch keys.

The two sets of touch buttons are available in all analyzer Modes. The five main menu touch keys and (up to) eight submenu touch keys provide control of measurement settings. In addition, you can touch other areas of the display screen to perform tasks that are also available from the menu keys.

For example:

- If you touch the RBW setting on the left side of the display (Instrument Settings Summary), then the bandwidth menu (BW) is displayed.
- If you place a marker on the screen, then you can touch the measurement trace to relocate the marker.
- If you touch the file type list box in one of the file management dialog boxes, then you can open the Filetype drop-down list to select a file type.
- If you touch the upper-right corner of the display screen in Spectrum Analyzer mode (near where the instrument displays "Spectrum Analyzer" on the screen), then the active measurement menu is displayed. If there is no active measurement, then the measurement menu is displayed (this is a shortcut, rather than pressing the **Shift** and **Measure** (**5**) keys).

Main Menu Touch Screen Keys

The five main menu touch keys vary in function depending on the selected mode of instrument operation. Available measurement modes are based on model and options purchased. Refer to Table 1-2 on page 1-4 for additional information.

These five main menu keys are arranged horizontally along the lower edge of the touch screen. The main menu key functions change to match specific instrument Mode settings. The main menu keys generate function-specific submenus. The various measurement modes are selected by pressing the **Shift** key and then the **Mode** (**9**) key. Descriptions of the various measurement modes can be found in the applicable Measurement Guides that are listed in "Related Documents" on page A-1. For more details about the main menu keys, refer to the section "Menu Keys Overview" on page 2-26. For more details about the Mode settings, refer to section "Mode Selector Menu" on page 2-18.

Submenu Touch Screen Keys

The submenu touch keys are located in the active function block (submenu key labels) along the right edge of the display. The submenu labels change as instrument measurement and parameter settings change. The current submenu title is shown at the top of the submenu key block. An example of the keys is shown in Figure 2-4.

Additional details are described in "Display Overview" on page 2-20.

Menu Key

Press the **Menu** key to display a grid of shortcut icons for installed measurement modes and user-selected menus and setup files.

Figure 2-6 shows the **Menu** key screen with shortcut icons for the installed measurement modes. Touch one of the icons in the top rows to change modes. These icons appear when the associated applications or options are installed and enabled. They cannot be moved or deleted. The display of the Menu screen will vary depending on the Spectrum Master model, firmware version, and installed options.
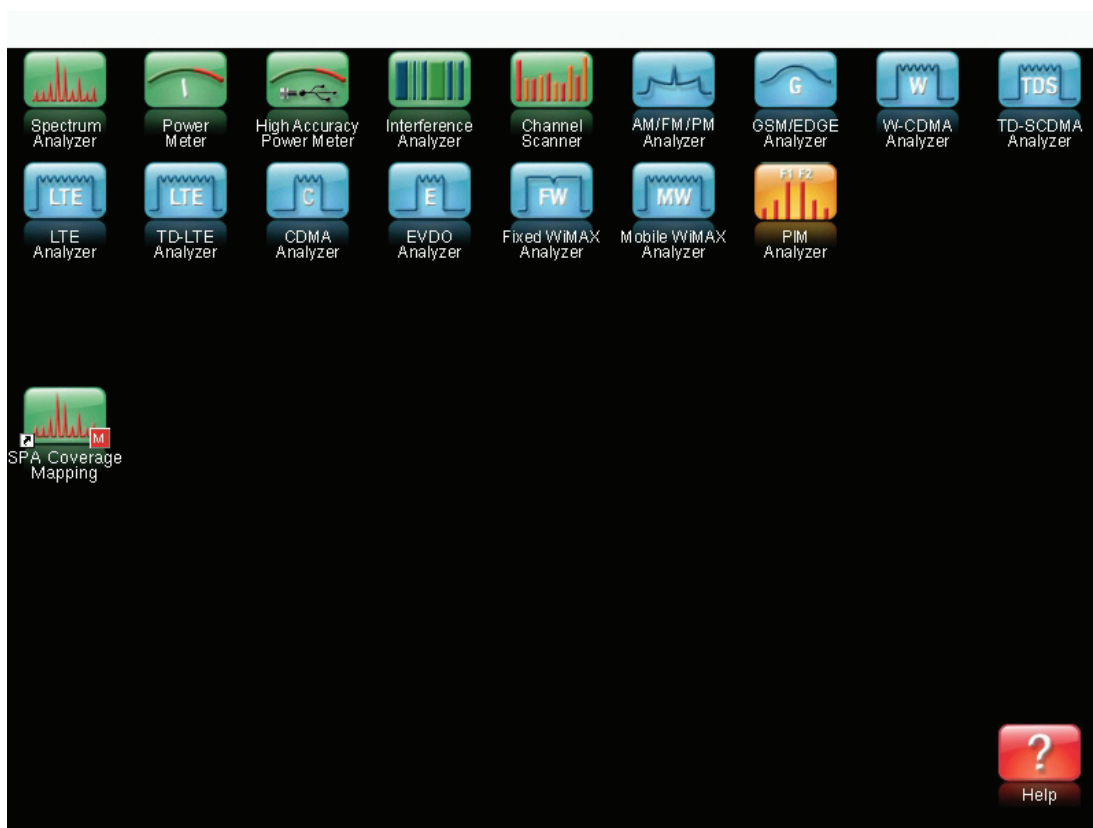
Figure 2-6.   Menu Key Screen, Icons for Installed Measurements and Shortcuts

Figure 2-7 shows the **Menu** key screen with shortcut icons for the installed measurement modes and four rows of user-defined shortcuts to menus and setup files.

Press and hold any key for a few seconds to add a shortcut to this screen. For example, to create a shortcut for setup files (.stp), open the Recall menu and hold down the desired file name for several seconds. Then select the location for the shortcut.
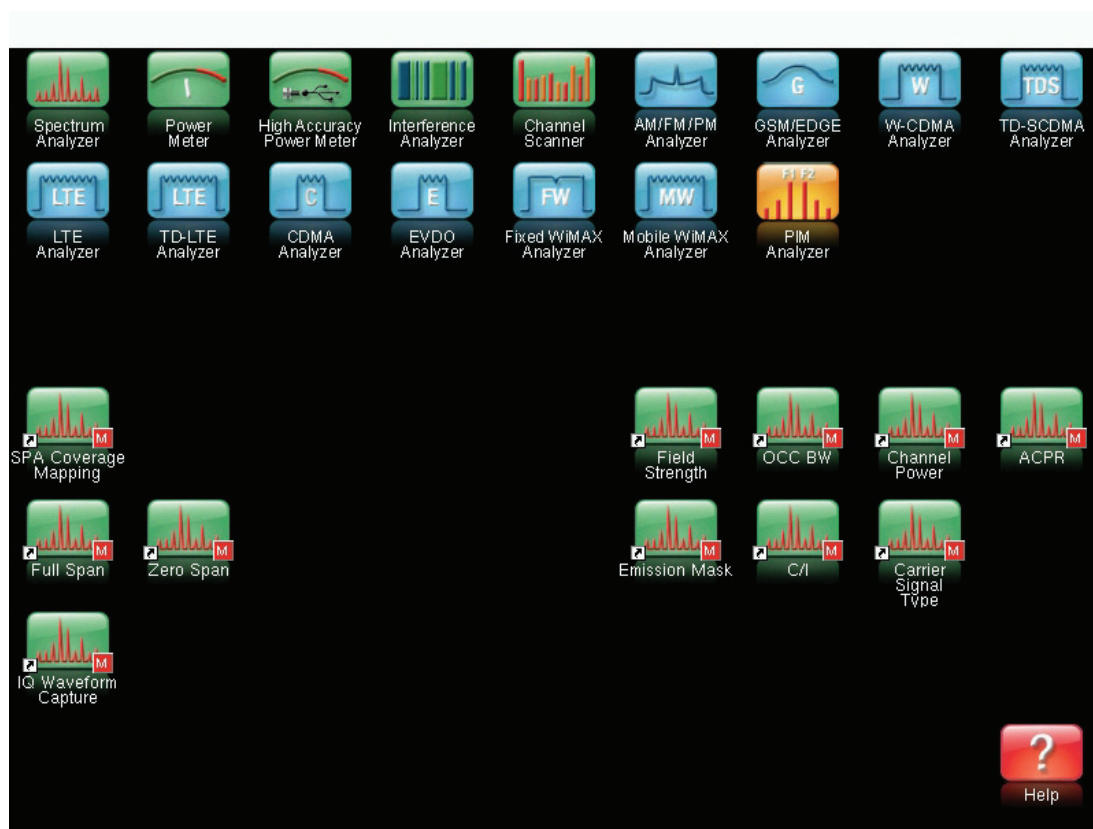
Figure 2-7. Menu Key Screen

User-defined shortcuts stay in memory until deleted. To delete or move a shortcut button, press the **Menu** key, then press and hold the shortcut for approximately 3 seconds. The Customize Button dialog box opens to allow a button to be deleted or moved. Press **Esc** to exit the Menu shortcut display.

Note	The Factory Default reset will delete all user created shortcut icons from the Menu screen. Refer to the "Reset Menu" on page 5-10 for additional information.

Help for the Menu shortcut screen is available by pressing the question mark icon in the lower-right corner of the display.

Figure 2-8.   Menu Help

2-7   Touch Screen Calibration

The Calibrate Touch Screen submenu key is in the "System Menu" on page 5-4. When pressed, the touch screen calibration message box is displayed with instructions for calibration. Calibration optimizes the response of touch input. You touch targets in sequence as they are displayed on the touch screen. This requires less than one minute.

Calibration is recommended if your touch inputs do not correspond to the appropriate locations on the screen. After the information box is displayed, press **Enter** to begin calibration, or press **Esc** to cancel.

You can also press **1** to use the arrow keys for navigation.

Calibrate Touch Screen Shortcut

You can access touch screen calibration by pressing **Shift** then **0** (zero). This displays the touch screen calibration message box. Press **Enter** to begin calibration, or press **Esc** to cancel. This shortcut can be used if your touch inputs do not correspond to the appropriate locations on the screen to such an extent that you cannot access the Calibrate Touch Screen submenu key.

Disable Touch Screen to Use Arrow Navigation

If the touch screen is not functioning, you can use Arrow Navigation to simulate pressing the touch screen main menu keys and submenu keys. From the touch screen calibration message box, press **1** to use arrow navigation. This displays the arrow navigation message box. Press **1** again to enter the arrow navigation mode, or press **Esc** to cancel.

In arrow navigation mode, a red selection box surrounds a key (see Figure 2-9 on page 2-17). Use the **Arrow** keys above the number keypad to move the red selection box. Then press the **Menu** key to activate the selected touch screen key. Note that only the main menu keys and submenu keys can be activated using Arrow Navigation. This feature does not move the red selection box into other areas of the touch screen.

To save a measurement in arrow navigation mode, press **Shift** then **File** (**7**). Use the **Arrow** keys to move the red selection box to the Save Measurement As submenu key. This submenu key must be used because the arrow navigation mode cannot be used to change data in popup windows in the measurement display. File names are determined by the current setting of the Save Measurement As submenu key. Refer to "Save Measurement As" on page 4-8.

You can save a JPEG image of the current display screen by pressing three keys, **Shift**, then **Decimal**, then **+/–**. The JEPG image shows screen data, but does not contain the additional measurement information that accompanies a saved measurement in a `*.spa` measurement file.

To return to normal touch entry mode, reboot the instrument (turn power Off and then On). If your touch screen has been damaged, refer to "Contacting Anritsu for Sales and Service" on page 1-2.
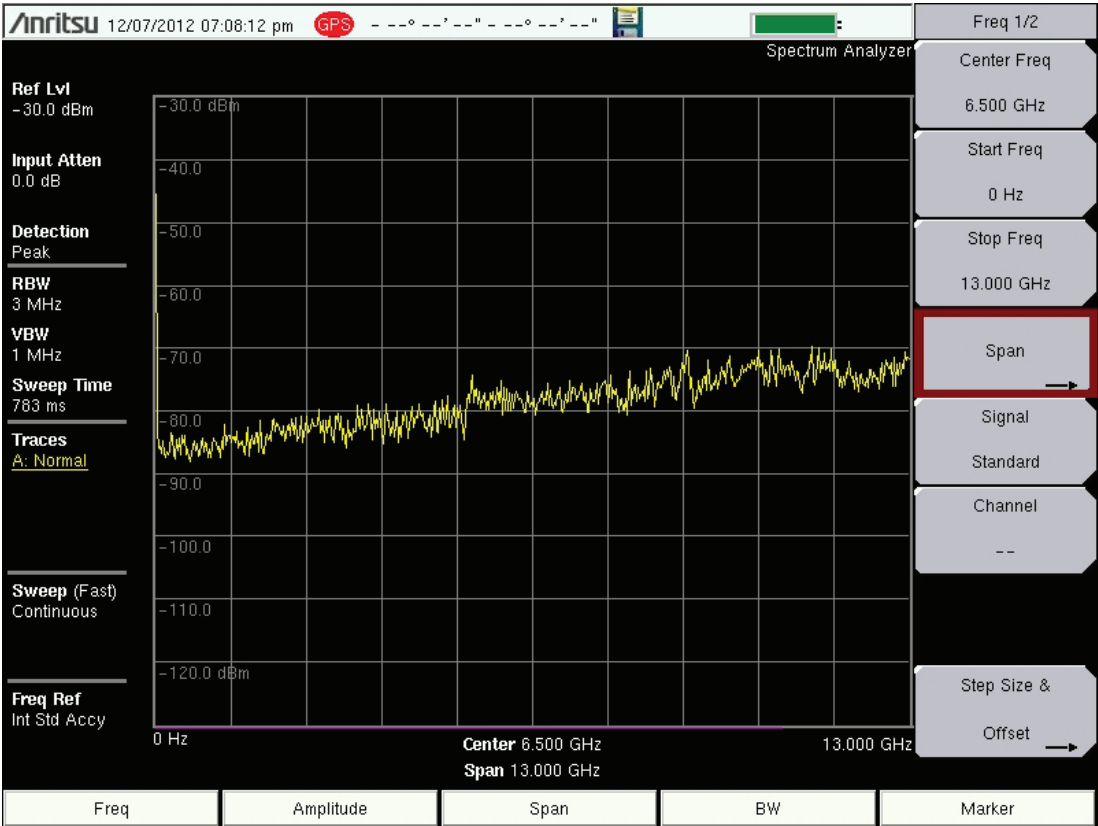
Figure 2-9.   Arrow Navigation Example

2-8   Mode Selector Menu

To access the functions under the Mode menu, press the **Shift** key, then the **Mode** (**9**) key. Use the directional arrow keys or the rotary knob to highlight the selection, and press the **Enter** key to select. The list of modes that appears in this menu will vary depending upon the options that are installed and activated in your instrument. This is an alternate method of selecting an instrument mode (see Figure 2-6 on page 2-13 for a description of the Menu Key screen). Figure 2-10 is an example of the Mode menu. Your instrument may not show the same list.
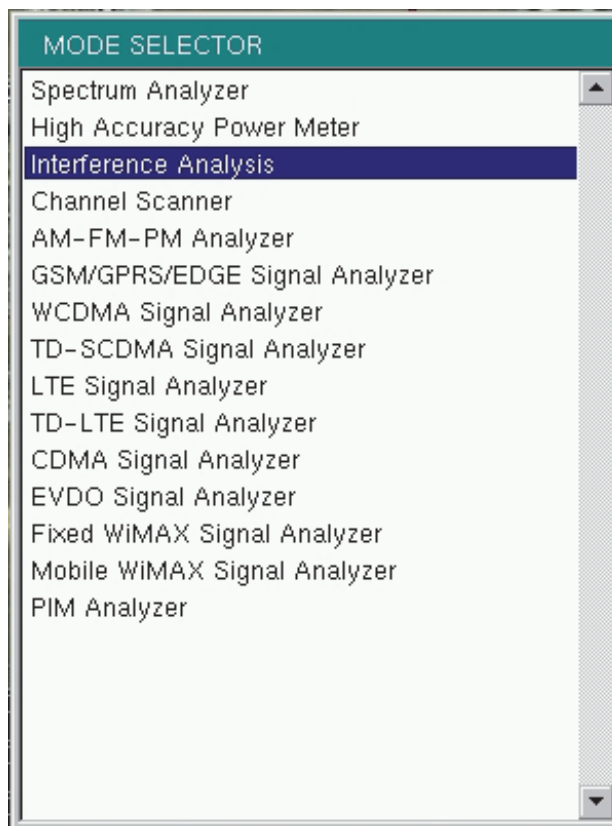
Figure 2-10. Mode Selector Menu

2-9   Secondary Function Menus

Pressing the **Shift** key and then a number key selects the menu function that is printed in blue characters above the number key (Figure 2-11).

Figure 2-11. Keypad and Secondary Function Menus

Not all Secondary Function Menus are active in various operation Modes. If any one of these ten menus is available in a specific instrument Mode of operation, then it can be called from the number keypad. It may also be available from a main menu key or a submenu key. The Secondary Function Menus are: Touch (**0**), Preset (**1**), Calibrate (**2**), Sweep (**3**), Measure (**4**), Trace (**5**), Limit (**6**), File (**7**), System (**8**), and Mode (**9**).

Note	**Shift** plus **Touch** (**0**) is for "Calibrate Touch Screen Shortcut" on page 2-16.

2-10   Display Overview

Typical measurement displays are shown for the basic Spectrum Analyzer mode of the MS2720T. Note that the images shown in this manual may be different from any images that are displayed on your Spectrum Master.

Spectrum Analyzer Mode

Figure 2-12 illustrates some of the key information areas of the MS2720T display. For more detailed key descriptions of the Spectrum Analyzer mode, refer to the Spectrum Analyzer Measurement Guide (Anritsu part number 10580-00349, available on the Documentation disc or the Anritsu web site). Also refer to Appendix A, "Related Documents", for a complete list of measurement guides.
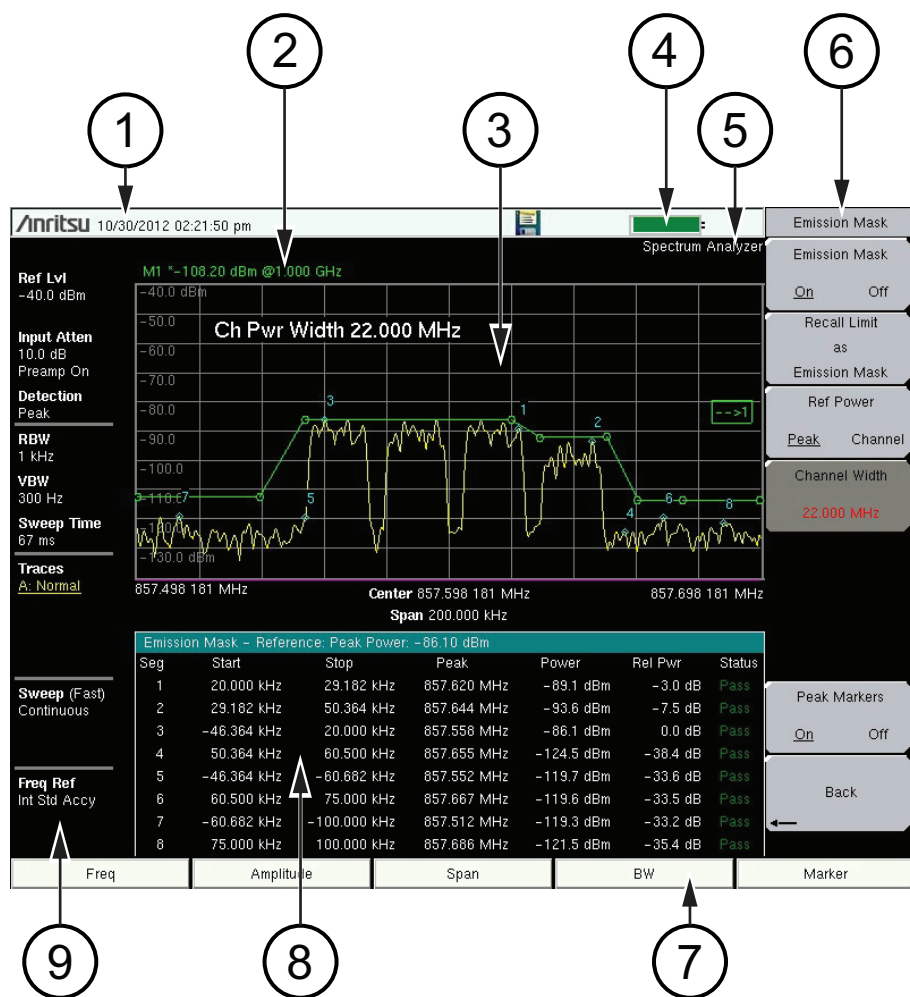
Figure 2-12. Spectrum Analyzer Display

1.	Real Time Clock (and Latitude and Longitude with GPS)
2.	Data Summary, Active Marker Values
3.	Measurement Display or Measurement Grid or Sweep Window
4.	Battery Charge Indicator
5.	Instrument Mode
6.	Submenu Key Labels or Active Function Block
7.	Main Menu Key Labels
8.	Optional Data Window (also location of Marker Table)
9.	Instrument Settings Summary

Instrument Settings Summary

Measurement settings that are displayed along the left edge of the measurement display (the instrument settings summary) and the Spectrum Analyzer annotation in the upper-right corner of the screen also function as touch screen shortcuts.

2-11 Parameter Setting

Pop-up list boxes or edit boxes are used to provide selection lists and selection editors. Scroll through a list of items or parameters with the arrow keys or the rotary knob. Select numerical values by scrolling with the arrow keys or rotary knob or by entering the digits directly from the number keypad. These list boxes and edit boxes frequently display a range of possible values or limits for possible values.

Finalize the input by pressing the rotary knob or the **Enter** key. At any time before finalizing the input, press the escape (**Esc**) key to abort the change and retain the previously existing setting.

Some parameters (such as for antennas or couplers) can be added to list boxes by creating them and importing them through the use of Master Software Tools.

2-12 Data Entry

Numeric Values

Numeric values are changed using the rotary knob, arrow keys, or the keypad. Pressing one of the main menu keys displays a list of submenus on the right side of the touch screen. When the value on a submenu key is displayed in the sweep window, it is ready for changing. When using the rotary knob or arrow keys, the changing value is shown on the submenu and in the sweep window. When using the keypad, the new value is shown in the sweep window, and the submenu changes to Units. Selecting a unit for the new value completes the entry.

Parameter Setting

Pop-up list boxes or edit boxes are used to provide selection lists and selection editors. Scroll through a list of items or parameters with the arrow keys, the rotary knob, or the touch screen. These list boxes and edit boxes frequently display a range of possible values or limits for possible values.

Finalize the input by pressing the **Enter** key. At any time before finalizing the input, press the escape (**Esc**) key to abort the change and retain the previously existing setting.

Some parameters (such as for antennas or couplers) can be added to list boxes by creating them and importing them using Master Software Tools (MST) or Anritsu Line Sweep Tools (LST).

Text Entry

When entering text (as when saving a measurement), the touch screen keyboard is displayed (Figure 2-13). Characters are entered directly with the touch screen keyboard. The keypad can be used for numeric entry. The left and right arrow keys scroll the cursor through the text. Refer to "Save Menu" on page 4-9 for additional information.
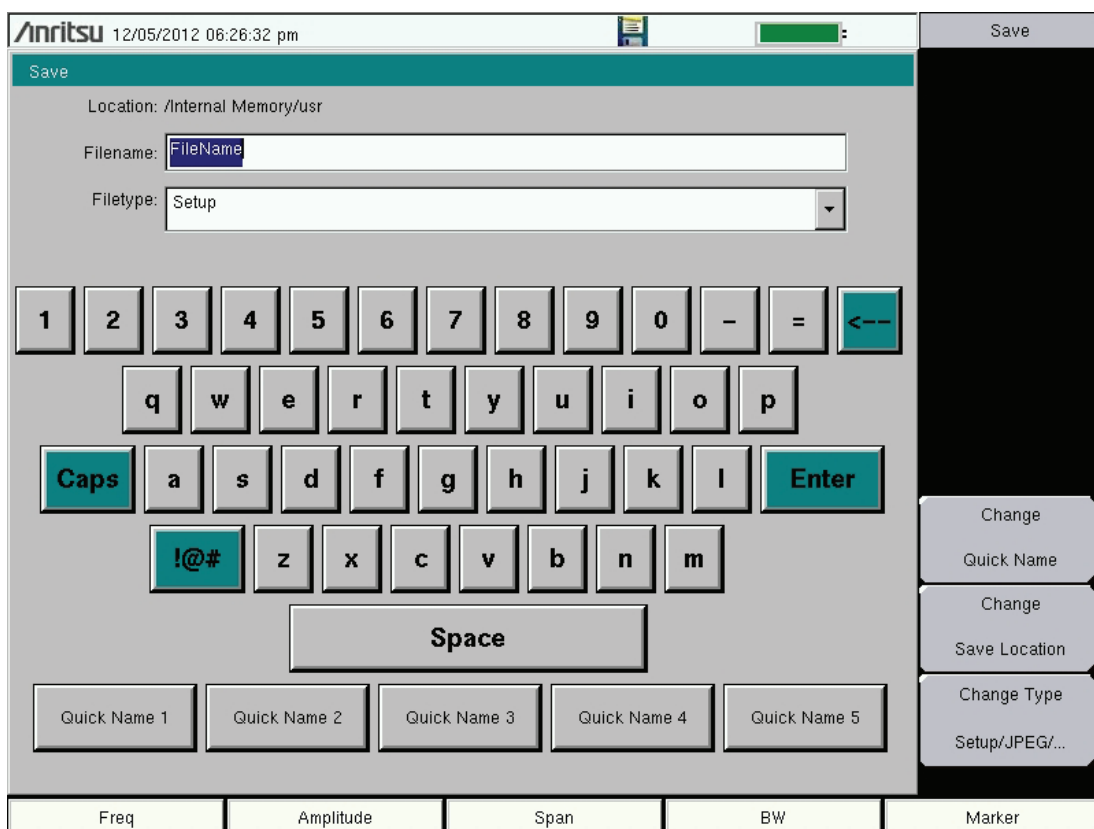
Figure 2-13. Touch Screen Keyboard for Saving a Measurement

2-13   Symbols and Indicators

The following symbols, icons, and indicators convey the instrument status or condition on the display. The colors shown here are in the standard or default display mode.

Table 2-1.   Symbols and Icons

Symbol	Description
	Green: Battery is 30 % to 100 % charged.
	Yellow: Battery is 10 % to 30 % charged.
	Red: Battery 0 % to 10 % charged.
	Green with Black Plug body: Battery is fully charged and external power is applied.
	Lightning Bolt: Battery is being charged (any color symbol).
	Red Plug body: External power is applied, and no battery is installed, or battery has lost communications with the instrument.
	Storage Icon: Tap the floppy disk icon to display the Save screen and menu.
	Camera Icon: Saves a JPEG image of the current screen display.
Shift	**Shift Key Icon:** This icon is displayed between the battery symbol and the submenu keys after the Shift key has been pressed, and until another key is pressed.
GPS GPS	**GPS Icon:** This icon is displayed right after the date and time when GPS is available. Refer to Chapter 6, "GPS (Option 31)" for details.
Power ● ● Charge	**Power Button with Power LED and Charge LED:** This is a physical button with LED indicators. It is located near the numeric keypad.

Symbols and Icons on the Status Bar
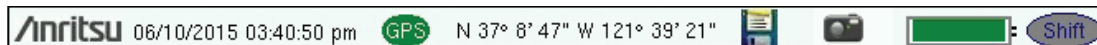
Figure 2-14. Status Bar with Icons

The instrument status bar displays the system date and time. When GPS is on and is tracking satellites, its icon is followed by latitude and longitude coordinates.

Touch the storage icon to open the touch screen keyboard for saving measurements, setups, limit lines, or screen display JPEG files. This shortcut to the "Save Menu" on page 4-9 is equivalent to pressing **Shift** and **File** (**7**), then Save. Refer to "Save Dialog Box" on page 4-3.

Touch the camera icon to save a screen display JPEG file.

The battery symbol indicates the charge remaining in the battery. The colored section inside the symbol changes size and color with the charge level. The Battery Charge LED (adjacent to the On/Off button) flashes when the battery is charging, and remains on steady when the battery is fully charged.

Caution	Use only Anritsu-approved batteries, adapters, and chargers with this instrument. Anritsu Company recommends removing the battery for long-term storage of the instrument.

The **Shift** key icon is displayed after the **Shift** key is pressed, and it remains displayed until another button is pressed.

2-14   Menu Keys Overview

Main Menu Keys

The Main Menu keys are located below the measurement display. These keys are used to list function-specific menus in the active menu (submenu labels). These Main Menu keys vary in function based on the selected mode of operation (**Shift, Mode** (9)). Refer to "Mode Selector Menu" on page 2-18 for more information on changing the instrument mode. Table 2-2 lists from left to right the Main Menu Key labels for each mode of instrument operation.

Table 2-2.   Mode-Dependent Main Menu Keys Located Below Measurement Display

Mode	Key 1	Key 2	Key 3	Key 4	Key 5
Spectrum Analyzer	Freq	Amplitude	Span	BW	Marker
Interference Analysis	Freq	Amplitude	BW	Measurements	Marker
Channel Scanner	Scanner	Amplitude	Custom Scan	Measurements	
High Accuracy Power Meter		Amplitude	Average	Zero/Cal	Limit
GSM/GPRS/EDGE	Freq	Amplitude	Setup	Measurements	Marker
W-CDMA/HSDPA	Freq	Amplitude	Setup	Measurements	Marker
TD-SCDMA/HSDPA	Freq	Amplitude	Setup	Measurements	
CDMA	Freq	Amplitude	Setup	Measurements	Marker
EV-DO	Freq	Amplitude	Setup	Measurements	Marker
LTE	Freq	Amplitude	Setup	Measurements	Marker
TD-LTE	Freq	Amplitude	Setup	Measurements	Marker
Fixed WiMAX	Freq	Amplitude	Setup	Measurements	
Mobile WiMAX	Freq	Amplitude	Setup	Measurements	Marker
DVB-T/H	Frequency	Amplitude	Setup	Measurements	Marker
AM/FM/PM Analyzer	Freq	Amplitude	Setup	Measurements	Marker
PIM Analyzer	Freq	Amplitude	Setup	Measurements	Marker

Submenu Keys

The eight submenu touch keys are located along the right edge of the measurement display. They change function depending upon the current mode and current menu selection. The current submenu title is shown at the top of the active function block (submenu keys labels). Refer to Figure 2-4 on page 2-8.

2-15   Soft Carrying Case

The instrument can be operated while in the soft carrying case. On the back of the case is a storage pouch for accessories and supplies. Inside the pouch is a D-ring that can be used to securely attach a small accessory.

To install the instrument into the soft carrying case:

1. The front panel of the case is secured with hook-and-loop fasteners. Fully close the front panel of the case. When closed, the front panel supports the shape of the case while you are inserting the Spectrum Master.

2. Place the soft carrying case face down on a stable surface, with the front panel fully closed and laying flat.

3. Fully open the zippered back of the case.

Note	Two zippers provide access around the back of the case. The zipper closer to the front of the case opens the case back, and allows access to install and remove the instrument. The zipper closer to the back of the case opens a support panel that can be used to provide support for improved stability and air flow while the instrument is in the case. The support panel angle is adjustable. This support panel also contains the storage pouch.

4. Insert the instrument face down into the case, taking care that the connectors are properly situated in the case top opening. You may find it easier to insert the connectors first, then pull the corners over the bottom of the Spectrum Master.

Figure 2-15. Soft Carrying Case

5. Close the back panel and secure with the zipper.

The soft carrying case includes a detachable shoulder strap, which can be connected to the D-rings on the corners of the case, as required for comfort or convenience. Using one upper corner and one lower corner holds the bottom of the instrument close to your chest and allows hands-free operation.

2-16   Tilt Bail Stand

The attached tilt bail can be used for desktop operation when the instrument is not installed in the soft case. The tilt bail provides a backward tilt for improved stability and air flow. To deploy the tilt bail, pull the bottom of the tilt bail away from the back of the instrument. To store the tilt bail, push the bottom of the bail towards the back of the instrument and snap the bail into the clip on the back of the instrument.

Chapter 3 — Initial Startup

3-1 Introduction

This chapter gives a brief overview of the Anritsu MS2720T Spectrum Master and is intended to assist you in your first use of the instrument. The purpose of this chapter is to provide a starting point for making basic measurement setups. This chapter describes general instrument setup, including: instrument mode, frequency, bandwidth, amplitude, span, limit lines, and markers. After measurements are taken, refer to "Managing Files" on page 4-1 for a description of saving, recalling, and deleting measurement files. For more detailed information about specific measurements, refer to the measurement descriptions in the measurement guides for the specific instrument mode and analyzer technology (such as Spectrum Analyzer, WiMAX, or 3GPP). Refer to Appendix A, "Related Documents", for a list of these measurement guides and their Anritsu part numbers.

The Spectrum Analyzer Measurement Guide includes sections that describe resolution bandwidth, video bandwidth, sweep, and attenuator functions. For example, in the Spectrum Master, 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, then the narrowest one dominates and is considered the resolution bandwidth.

3-2   Measurement Setup

Connect the Input Source

Connect the input signal or antenna to the RF In connector on the top of the instrument. For connector descriptions, see Figure 2-2 on page 2-3.

Editing and Entering Values

- Parameter values that are ready for editing are displayed in red on the submenu key. After changing the value, press **Enter** to set the new value.

- Some submenu keys have toggled parameter values (On / Off, Low / High, On/Large/Off). On these submenu keys, the current value is underlined. Press the submenu key to toggle the value.

- Use the **Arrow** keys, numeric keypad, or rotary knob to change submenu key values or to select list box options.

Selecting the Analyzer Mode

The instrument Analyzer Modes are also referred to as Measurement Modes or Applications. To switch to a different mode:

1. Press the **Menu** button on the instrument front panel.

2. Press the desired screen icon. Refer to "Menu Key" on page 2-13.

Alternatively, you can:

1. Press **Shift** followed by the **Mode** (**9**) key on the numeric keypad to display the Mode Selector list of installed applications (refer to "Mode Selector Menu" on page 2-18).

2. Use the directional **Arrow** keys or the rotary knob to highlight the desired mode. The left and right **Arrow** keys skip to the top and bottom of the list, respectively.

3. Press **Enter**.

To exit without changing the selection, press **Esc**.

3-3   Set the Measurement Frequency

Using Start and Stop Frequencies

The frequency settings and the submenu keys are displayed on the left and right edges of the
graph in the sweep window.

  1. Press the **Freq** main menu key.

  2. Press the Start Freq submenu key.

  3. Enter the desired start frequency. When entering a frequency by using the keypad, the
      submenu key labels change to frequency units: GHz, MHz, kHz, and Hz. Press the
      appropriate unit key. Pressing the **Enter** key has the same effect as pressing the MHz
      submenu key.

  4. Press the Stop Freq submenu key.

  5. Enter the desired stop frequency.

Entering Center Frequency

  1. Press the **Freq** main menu key.

  2. Press the Center Freq submenu key.

  3. Enter the desired center frequency using the keypad, the arrow keys, or the rotary knob.
      When entering a frequency by using the keypad, the submenu key labels change to
      frequency units: GHz, MHz, kHz, and Hz. Press the appropriate unit key. Pressing the
      Enter key has the same effect as pressing the MHz submenu key.

The current setting is shown at the top of the instrument settings summary column on the
left side of the measurement display (refer to Figure 2-12, "Spectrum Analyzer Display"
on page 2-21).

Selecting Signal Standard

  1. Press the **Freq** main menu key.

  2. Press the Signal Standard submenu key. The Signal Standards list is displayed.

  3. Use the rotary knob or press a signal standard on the list to highlight it, then press
      Enter to select.

  4. Optionally, press the Channel submenu key to change the channel value in the Channel
      Editor.

Note	The signal standards list can be updated via Master Software Tools.

Setting Measurement Frequency Bandwidth

Spectrum Analyzer and Interference Analysis Mode

  1. Press the **BW** main menu key to display the BW menu.

      • Press the RBW or the VBW submenu key (or both) to manually change values.

- Set RBW and VBW automatically by pressing the Auto RBW submenu key or the Auto VBW submenu key.

2. Press the VBW/Average Type submenu key to toggle between Linear averaging (arithmetic mean) and Logarithmic averaging (geometric mean).

3. Press the RBW/VBW submenu key to change the ratio of resolution bandwidth to video bandwidth.

4. Press the Span/RBW submenu key to change the ratio of span width to resolution bandwidth.

3-4   Set the Amplitude

Press the **Amplitude** main menu key to display the Amplitude menu.

Setting Amplitude Reference Level and Scale

Spectrum Analyzer and Interference Analysis Modes

To change the current measurement units, press the Units submenu key and select the required units from the submenu keys that are presented. Press the Back submenu key to return to the Amplitude menu.

1. Press the Reference Level submenu key and use the **Up/Down** arrow keys or the keypad to change the reference level. Press **Enter** to set the reference level value.

2. Press the Scale submenu key and use the **Up/Down** arrow keys or the keypad to enter the desired scale. Press **Enter** to set the scale value.

Note	The Scale parameter cannot be changed when linear units are selected (Watts or Volts).
	Press the Amplitude submenu 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. Attenuator Functions are described in the Spectrum Analyzer Measurement Guide.

Setting Amplitude Range and Scale

This setting applies to most demodulator modes of instrument operation. The Spectrum Analyzer mode has no equivalent to Auto Range. For other analyzer modes, consult the individual measurement guides. Refer to Appendix A.

1. Press the Adjust Range submenu key to set an optimal reference level based on the measured signal.

   To have the instrument continually set the optimal reference level, press the **Auto Range** submenu key so that On is selected.

2. Press the Scale submenu key.

3. Enter the desired scale units by using the keypad, the **Arrow** keys, or the rotary knob. Press the **Enter** key to set. The y-axis scale is automatically renumbered.

Reference Level Offset for External Loss or External Gain

To obtain accurate measurements, compensate for any external attenuation or gain by using the RL Offset submenu. The compensation factor is in dB. External attenuation can be created by using an external cable or an external high power attenuator, external gain is typically from an amplifier.

To adjust the reference level for either gain or loss, press the RL Offset submenu key and enter a positive dB value and then press the appropriate submenu key (dB External Gain or dB External Loss). The new RL Offset value will be displayed on the instrument and reference level is adjusted.

3-5   Set the Span

Spectrum Analyzer and Interference Analysis Modes

1. Press the **Span** main menu key or press the **Freq** main menu key followed by the Span submenu key.

2. To select full span, press the Full Span submenu key. Selecting full span overrides any previously set Start and Stop frequencies.

3. For a single frequency measurement, press the Zero Span submenu key.

Note	To quickly move the span value up or down, press the Span Up 1-2-5 or Span Down 1-2-5 submenu keys These keys facilitate a zoom-in, zoom-out feature in a 1-2-5 sequence.

3-6   Setting Up Limit Lines

Press the **Shift** key then the **Limit** (**6**) key on the numeric keypad to display the Limit menu.

Simple Limit Line

Spectrum Analyzer and Interference Analysis Modes

   1. Press the **Shift** key and then the **Limit** (**6**) key.

   2. Press the Limit (Upper / Lower) submenu key to select the desired limit line, Upper or Lower.

   3. Activate the selected limit line by pressing the On Off submenu key so that On is underlined.

   4. Press the Limit Move submenu key to display the Limit Move menu. Press the Move Limit submenu key to change the dBm level of the limit line.

   5. Press the Back submenu key to return to the Limit menu.

   6. If necessary, press the Set Default Limit submenu key to redraw the limit line in view.

Limit Line Envelope

Spectrum Analyzer and Interference Analysis Modes

Using Limit Envelope:

   1. Press the **Shift** key and then the **Limit** (**6**) key.

   2. Press the Limit (Upper / Lower) submenu key to select the desired limit line, Upper or Lower.

   3. Press the Limit Envelope submenu key to display the Limit Envelope menu.

   4. Press the Create Envelope submenu key to create an envelope around the measurement.

   5. Press Upper Points or Lower Points submenu key to change the number of segments in the envelope.

   6. Press the Upper Shape or Lower Shape submenu key to toggle between square and sloped limit envelope.

   7. Adjust the Upper or Lower Offset to move the limit line closer to (a smaller value) or further away from the trace.

Complex Limit Lines

Spectrum Analyzer and Interference Analysis Modes

Figure 3-1 shows an example of a complex limit line.
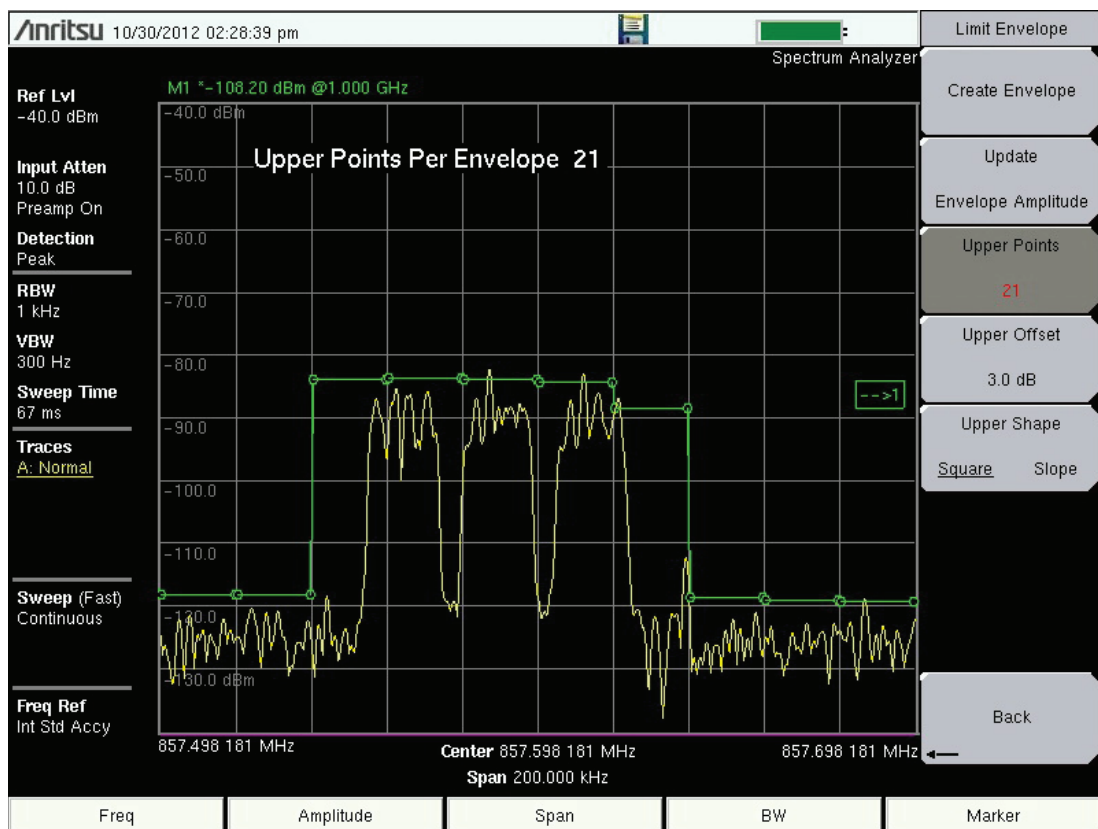
Figure 3-1.   Complex Limit Line Example

When building some complex limit lines, you can create either the right or left half of the limit line and then build the remainder by pressing the Limit Advanced submenu key and then pressing the Limit Mirror submenu key. The complete set of Limit menus is described in the Spectrum Analyzer Measurement Guide (refer to Appendix A).

3-7   Setting Up Markers

Press the **Marker** main menu key to display the Select Marker box. See Figure 3-3. Touch a marker number to activate that marker. After a marker is active, other submenu keys can be used to place the marker. Refer to the "Spectrum Analyzer Measurement Guide (10580-00349)" for more details.

Selecting, Activating, and Placing a Marker

Select Marker		
M1	M2	M3
M4	M5	M6

Figure 3-2.   Marker Selection Box

1. Press the Marker submenu key to display the Select Marker box. Press the desired marker number. The selected marker number is displayed in the sweep window and is also underlined on the Marker submenu key.

2. Press the On Off submenu key (if necessary) so that On is underlined. The selected marker is displayed in red, ready to be moved.

3. Use the rotary knob, an **Arrow** key, or the touch screen to place the marker on the desired frequency.

   Note that when a marker is active, you can drag your finger across the sweep window horizontally (at any level) to move the marker. Also, when a marker is active and the Marker menu is displayed, you can type a frequency to place the active marker at a point of interest.

4. Press the Peak Search submenu key to move the active marker to the highest signal amplitude that is currently displayed on screen. For additional marker movements, press the More Peak Options submenu key. Refer to the Spectrum Analyzer Measurement Guide for more details.

5. Repeat Step 1 and Step 2 to activate and move multiple markers.

Selecting, Activating, and Placing a Delta Marker:

When a delta marker is On, its position data is relative to its reference marker. For example, Delta Marker 3 displays x-axis and y-axis data relative to Marker 3. This reference relationship differs when using the "Marker 1 Reference" submenu key as described on page 3-10.

1. Press the Marker submenu key and then select a marker in the list box.

2. Press the Delta On Off submenu key so that On is underlined. The selected marker is displayed in red, ready to be moved.

3. Use the rotary knob, **Arrow** keys, touch screen, or the numeric keypad to place the delta marker on the desired offset frequency from the associated reference marker.

4. Repeat Step 1 and Step 2 to activate and move multiple delta markers.

Viewing Marker Data in a Table Format

   1. Press the More submenu key.

   2. Press the Marker Table submenu key so that On is underlined. All marker data and delta
       marker data are displayed in a table under the measurement graph. If Marker Table is
       set to Large, then the table has room for only the x-axis and y-axis data for one marker,
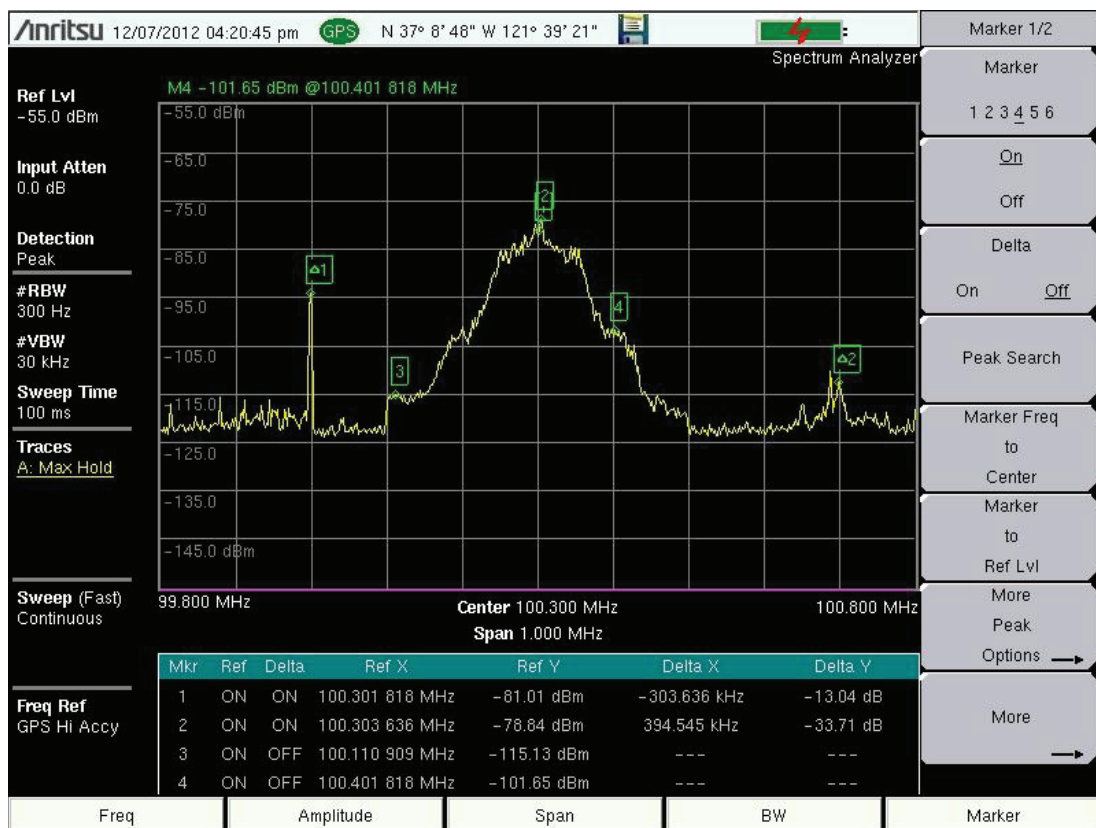   which is the active marker. Select another marker to view its values in the large table.

Figure 3-3.   Markers with Table

Marker Table Set to Large

To change the marker that is displayed in the large marker table, make another marker
active by selecting it in the Marker Selection box. If you want to make a delta marker active
without changing its location, first select its reference marker. The Delta submenu key will
have **On** underlined, indicating that the delta maker is in use. Press the Delta key once. The
delta marker will remain On, its position will not change, it will become the active marker,
and its x-axis and y-axis data will then be displayed in the large Marker Table.

Marker 1 Reference

The Marker 1 Reference submenu key is in the Marker (2/2) menu. When turned On, this feature sets reference Marker 1 to On, and turns On all six delta markers in positions relative to Marker 1. These six positions are spaced evenly across the current measurement span.

This feature is useful for examining measurement events such as spurs, harmonics, and phase noise.

3-8   Selecting a Measurement Type

1. If needed, press the **Menu** key, then touch the appropriate application screen icon to switch measurement mode.

   Alternatively, press **Shift** followed by **Mode** (**9**), then select the desired measurement mode from the Mode Selector list and press **Enter**.

2. Press **Shift** followed by **Meas** (**4**), then press one of the measurement type submenu keys to select it.

   Some measurement modes display a **Measurements** main menu key on the instrument screen. In this case, you can press this key, then one of the submenu keys to select the desired measurement type.

3-9   Saving Measurements

1. Press **Shift** then **File** (**7**).

2. Press the Save Measurement submenu key.

3. If needed, press the Filetype field and select Measurement from the drop-down list. Alternatively, press the Change Type (Setup/JPG/…) submenu key, then select Measurement in the Select File Type dialog and press **Enter**.

4. Optionally, press the Change Save Location submenu key to change the default location where saved files will be stored.

5. Enter the file name using the touch screen keyboard, then press **Enter**.

Refer to Chapter 4, "File Management" for additional information.

3-10   Master Software Tools

Anritsu Master Software Tools is a Microsoft® Windows® compatible program for transferring and editing saved measurements, markers, and limit lines to a PC. Refer to Chapter 8, "Anritsu Tool Box" for an overview of MST.

3-11   External Power On

The When DC Applied setting in the Power-On menu allows the Spectrum Master to restart automatically when external DC power is applied to the connector shown as item 5 in Figure 2-3 on page 2-4. Refer to "External Power" on page 2-5 and the "Power–On Menu" on page 5-7.

When this feature is enabled, the Spectrum Master in the off state will turn on when external DC power is applied. The instrument turns off when external power is removed, even if a battery is installed. This is useful for high-reliability remote operation, where the instrument may need to be rebooted using a remotely-controlled power switch.

If the instrument is turned on with the power switch, then external power is removed, the instrument will continue to run until the battery is depleted. It will come on and the battery will begin recharging when external power is applied. This state is useful when the instrument is in a location where the power source may be interrupted.

Chapter 4 — File Management

4-1   Introduction

This chapter describes the file management features of the Spectrum Master and the file management menus. The submenus under the File menu allow you to save, recall, copy, and delete files in internal memory or an external USB flash drive.

4-2   Managing Files

Press the **Shift** key, then the **File** (**7**) key on the numeric keypad to display the **File** menu. The following steps describe file management.

Note	When navigating through the **File** menu, pressing the **Esc** key returns the menu display to the previous menu.

File Types

In the Save, Recall, Copy, and Delete menus, a submenu key is used to select the type of files to be managed. The Change Type Setup/JPEG/... and File Type_ALL submenu keys open the Select File Type list box, which displays all of the file types that can be selected in the current instrument mode.

The Select File Type list box may contain some of the following entries:

- ALL (displays all file types)
- Setup, `*.stp`
  (Setup files contain basic instrument information, measurement mode setup details, measurement marker data, and limit data.)
- Measurement, `*.spa, *.ia, *.cs, *.edg, *.wcd, *.tds, *.lte, *.tdlte, *.cdma, *.evdo, *.wmxd, *.wmxe, *.afp`
  (Measurement files contain all of the information in the setup files and the measurement data.)
- JPEG, `*.jpg`
- Limit Lines, `*.lim`
  (The Limit Line file contains limit line data details.)
- Spurious Emission Mask, `*.spe`
  (The Spurious Emission Mask file contains the frequency, amplitude, and other information related to segments in an out-of-band spurious emission mask.)
- KML 2D, `*.kml`
- KML 3D, `*.kml`
- Mapping Tab Delimited, `*.mtd`

You can also use the touch screen to open the drop down list for the Filetype entry box, as shown in .

Saving Files

The submenu keys that are available for file management may vary with instrument options and analyzer modes.

Set the Save Location

Press the Save submenu key, then the Change Save Location key, and select the location to save files (refer to "Save Location Menu" on page 4-10). You can save files to the internal memory or to an external USB flash drive. You can also create new folders. If an external USB flash drive is connected or disconnected, press Refresh Directories to update the location tree. Press the Set Location submenu key to store the save location.

Save a Measurement As

The Save Measurement As submenu key is used to quickly save measurements with a specific file name. The Spectrum Master saves the measurement with the latest file name that was used to save a measurement and with a number that is automatically incremented and appended to the end of the file name. For instance, if the last measurement was saved with the name ACPR, pressing Save Measurement As saves the next measurement as ACPR_#1, ACPR_#2, and so forth. The file name that is used can be changed by using the Save dialog box (Figure 4-1).

Save a Measurement

Press the Save Measurement submenu key and enter the name for the measurement file. The file type defaults to measurement, and the appropriate extension is added based on the current measurement mode. For more information about file types, refer to "File Types" on page 4-1.

Save a Setup

Press the Save submenu key, type a name for the setup file, confirm that the file type is Setup by using the Change Type submenu key or the Filetype drop down menu, then press **Enter** to save.

Note	A setup also can be saved and recalled from the Preset menu.

Create a Menu Shortcut for a Setup file

Press the Recall submenu key to display saved setup files. Locate the setup file to be the shortcut and then press and hold on the file name (on the touch screen) for a few seconds. Select a location in the shortcut grid to save the setup file. The shortcut grid is for the touch screen shortcut buttons that are displayed by pressing the **Menu** key.

Save a Measurement Screen as JPEG

Press the Save submenu key, type a name for the JPEG file, confirm that the file type is JPEG, and press **Enter** to save.

Note	You can also save the Measurement at this step by selecting the filetype as Measurement & JPG.

Save Dialog Box

The Save dialog box (Figure 4-1) is used to store files in internal memory or on an external drive. The file type, file name, and save location are set via this window. Refer to "Save Menu" on page 4-9 and "Save Location Menu" on page 4-10 for details.
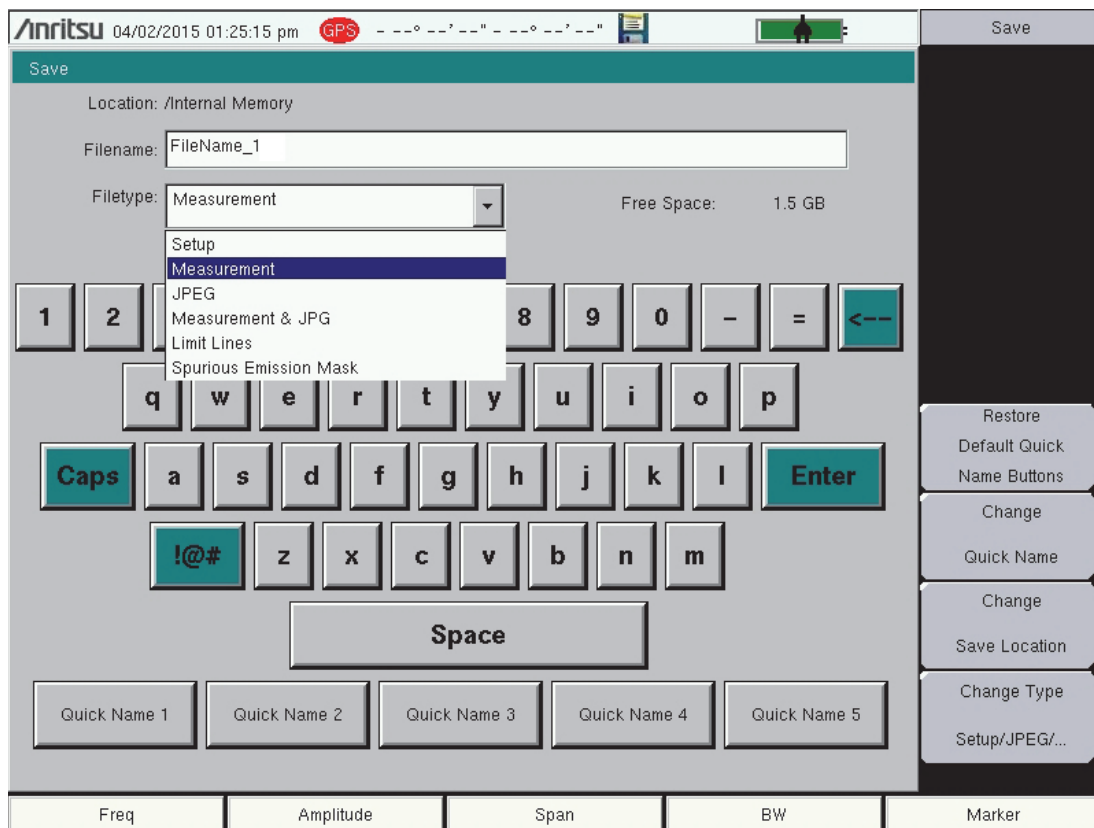
Figure 4-1.   Save Dialog Box

Quick Name Keys

Quick Name keys below the keyboard in Figure 4-1 let you enter frequently used file names, or parts of a file name, with a single touch of a button. Pressing multiple Quick Name keys in succession appends the associated text strings in the Filename text box.

To edit a Quick Name key:

    1. Press the disk icon at the top of the instrument screen to display the Save dialog. Alternatively, you can press **Shift** and **File** (**7**), then Save.

    2. Press the Change Quick Name submenu key.

    3. Select the Quick Name to edit and press **Enter**.

    4. Enter the desired string in the text box, then press **Enter**. In the Save dialog, the edited Quick Name key will show the new text.

Recalling Files

The Recall menu and dialog box let you control the listing of contents in the instrument's internal memory and an external drive, typically a USB memory stick, if connected.

You can sort files in the Recall menu by name, date, or type. You can also choose to view only measurement files or only setup files by pressing File Type on the Recall dialog box and by selecting the file type that you want to view. Refer to "File Types" on page 4-1.

Recall a Measurement

From the **File** menu, press the Recall Measurement submenu key, select the measurement with the touch screen, rotary knob, or the **Up/Down** arrow keys, and then press **Enter**.

Recall a Setup

Press the Recall submenu key. Confirm that the file type is Setup or All. Select the setup file (`*.stp`) with the touch screen, rotary knob, or the **Up/Down** arrow keys, 2then press **Enter**.

Recall Dialog Box

The Recall dialog box (Figure 4-2) allows you to open previously saved measurements and setups. Refer to the "Recall Menu" on page 4-12 for additional information.
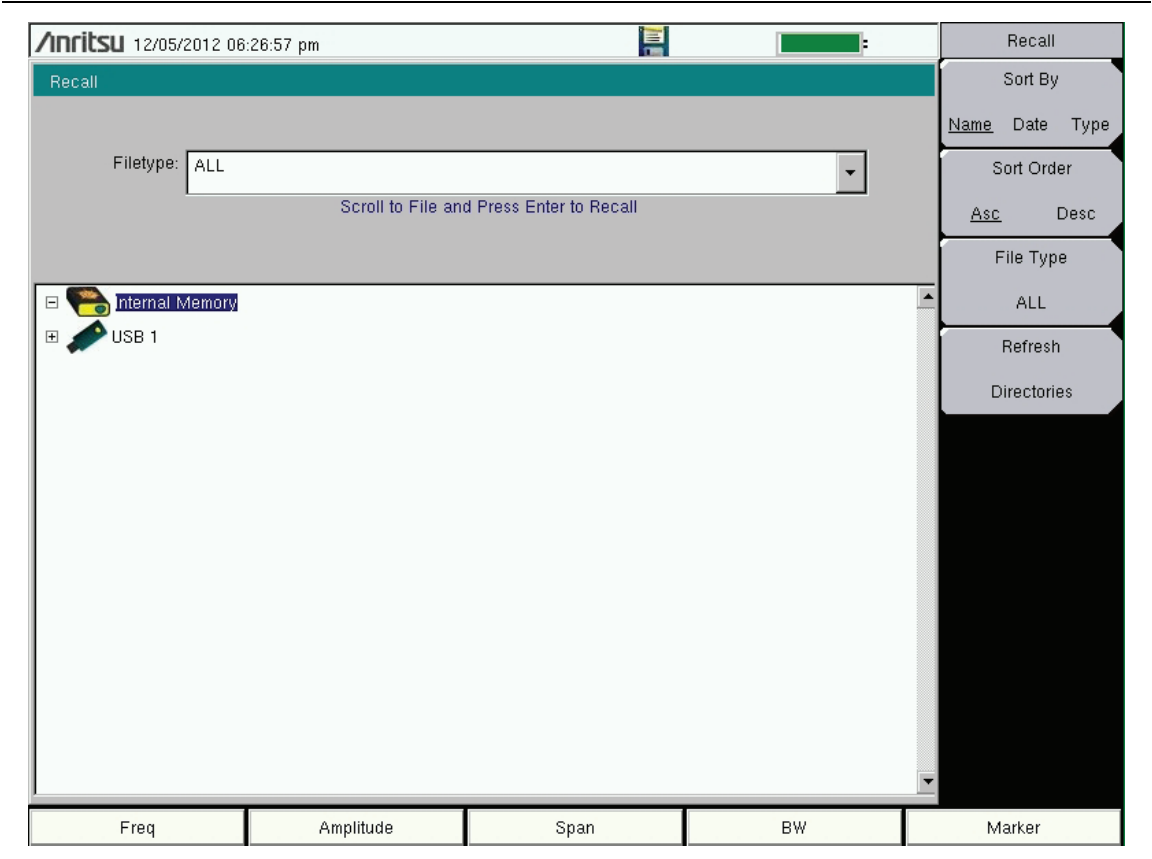

Figure 4-2.   Recall Dialog Box

Copying Files

Select the file or files to be copied in the top pane of the Copy screen and select the destination in the bottom pane (Figure 4-3). Refer to the "Copy Menu" on page 4-14. Follow the steps below to copy to or from a USB drive.

1. Insert a USB drive into either of the USB ports of the Spectrum Master.

2. Press **Shift** and **File** (**7**), then Copy. The Copy submenu and Copy screen are displayed.

3. In the source (Src) pane at the top, select the file to be copied. To navigate to files inside a folder, select the folder and press **Enter**. Selected files are highlighted in blue.

To select multiple files, press the Select or De-Select submenu key to keep the currently highlighted file selected, then use the **Up/Down** arrow keys or the rotary knob to scroll to the next file and repeat until all the files to be copied are highlighted in blue.

4. Press the Scroll submenu key to switch to the destination (Dst) pane and navigate to the desired location using the **Up/Down** arrow keys or the rotary knob. Press the **Enter** or the **Right** arrow key to expand the selected drive or folder. The **Left** arrow key collapses the folder.

5. Press the Copy key to copy the selected file or files. Press **Esc** at any time to exit the submenu without copying.
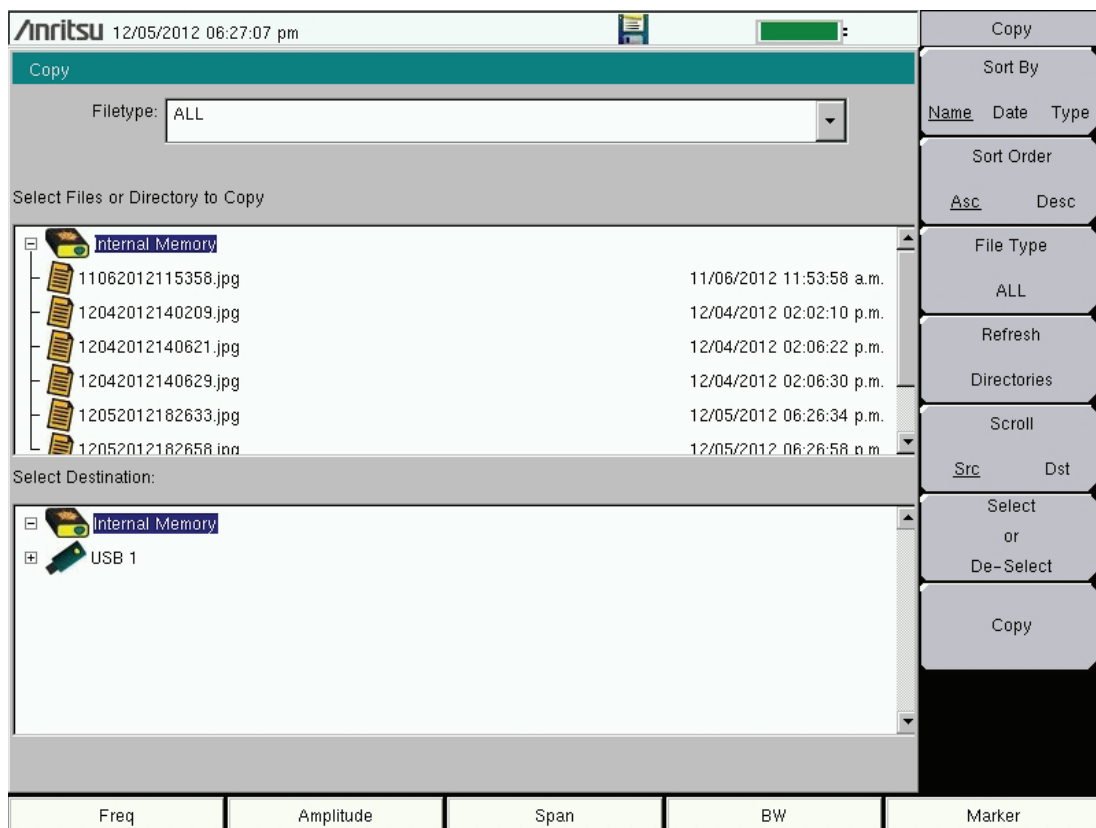
Figure 4-3.   Copy Dialog Box

Deleting Files

Delete a Selected File or Files

Press the Delete submenu key. Highlight the file to be deleted with the touch screen or with the **Up/Down** arrow keys. Press the Select or De-Select key to include desired files. A selected file will be outlined in blue. Press the Delete key and then press **Enter** to delete the selected file (or group of files).

Delete Dialog Box

Press the Delete submenu key to open the Delete dialog box (Figure 4-4). The submenus allow sorting files by type, name, and saved date. Refer to the "Delete Menu" on page 4-16 for additional information.
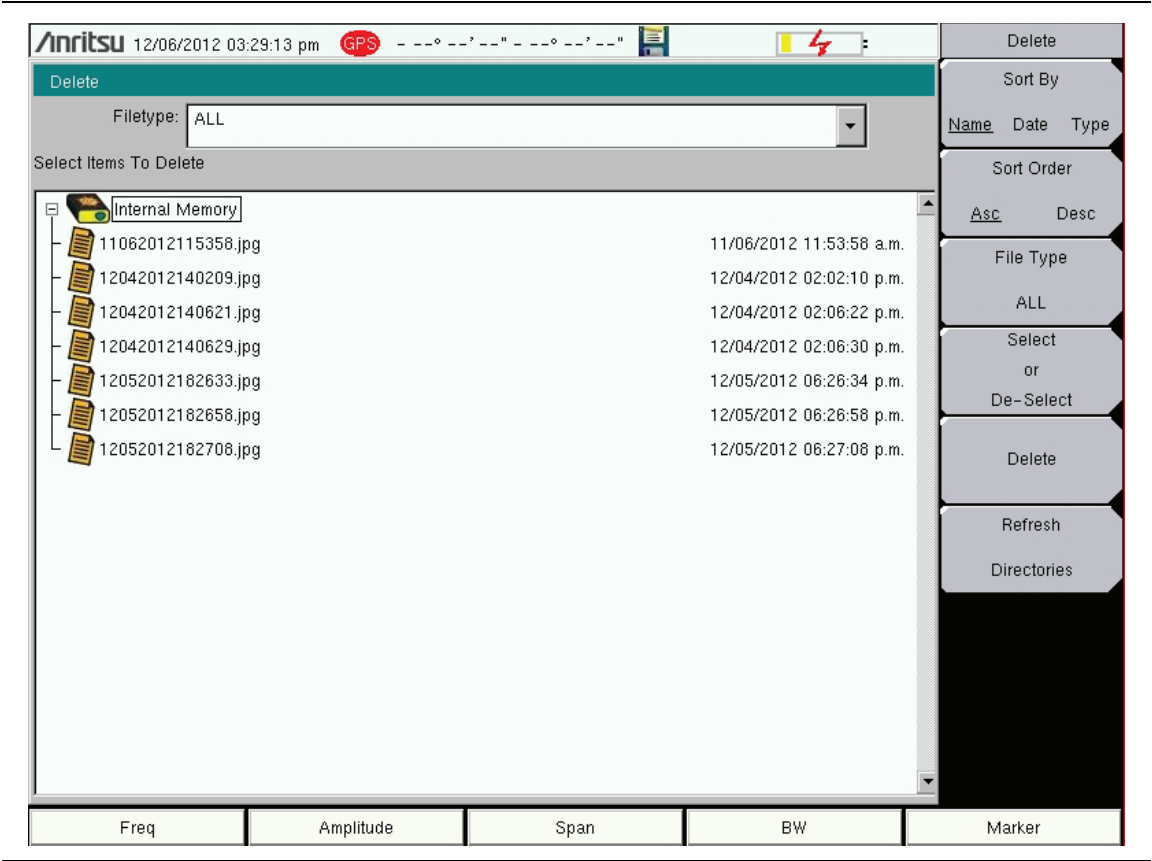

Figure 4-4.   Delete Dialog Box

4-3   File Menu Overview

Open the File menu by pressing the **Shift** key, then the **File** (**7**) key. Menu maps typically display all possible submenu keys, although some keys are displayed on the instrument only under special circumstances (refer to menu descriptions on the following pages).
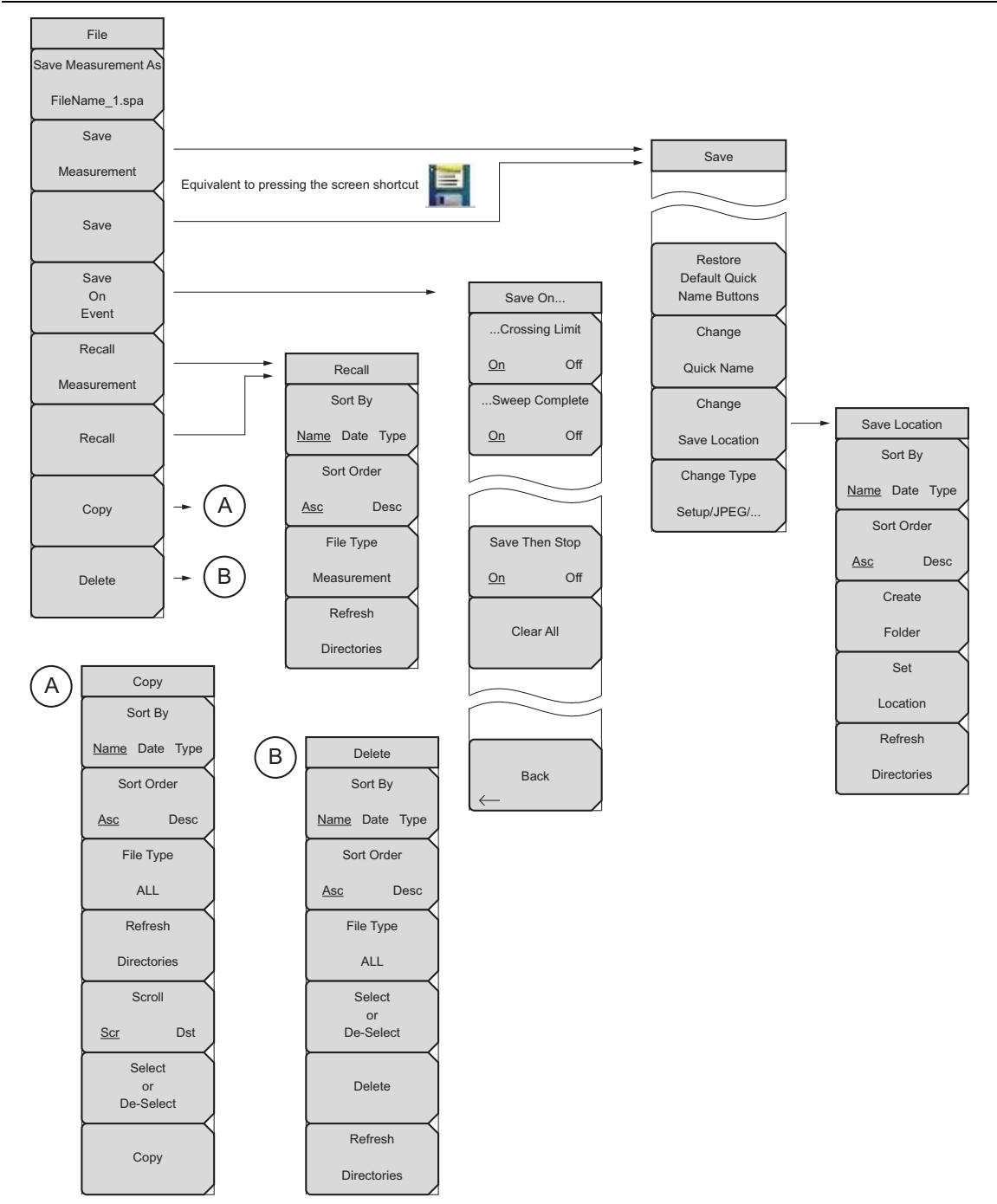

Figure 4-5.   File Menu Overview

4-4   File Menu

Key Sequence: **Shift** > **File (7)**

File
Save Measurement As
FileName_1.spa
Save Measurement
Save
Save On Event
Recall Measurement
Recall
Copy
Delete

Save Measurement As: Pressing this key will save instrument setup parameters, trace data, and any measurement results to the file that is named on the submenu key. Upon Save completion, the file name numerical suffix increments by 1 and will be applied to the next Save. The file extension is determined by the current measurement mode, such as .spa for Spectrum Analyzer mode.

To save to a different file name than the default shown, or to change the save location, use the Save Measurement or the Save submenu key.

Save Measurement: Press this submenu key to display the "Save Menu" and Save dialog box. You can optionally enter a different file name using the keyboard in the Save dialog. You may also select the file type from the drop down menu, as illustrated in Figure 4-8 on page 4-9. The list of available file types varies with the measurement mode.

Press **Enter** to save to the named file and return to the File menu. Pressing **Esc** exits the Save menu and dialog without saving.

The destination file or files for the saved data may be in the instrument's internal memory or an external drive, typically a USB drive. To change the save location, refer to the "Save Location Menu" on page 4-10.

Save: Press this submenu key to display the "Save Menu" and Save dialog box. The available settings are the same as those of the Save Measurement key.

Save on Event (Not available in all modes of operation)**:** Press this submenu key to display the "Save On Event Menu" on page 4-11.

Recall Measurement: Press this submenu key to display the "Recall Menu" on page 4-12. Use this menu to recall measurement files from internal memory or an external drive, such as a USB memory stick.

Recall: Press this submenu key to display the "Recall Menu" on page 4-12. Use this menu to recall files (such as measurements, setups, limit lines, maps) from internal memory or an external drive.

Copy: Press this submenu key to display the "Copy Menu" on page 4-14. Use this menu to copy files and folders between internal memory and an external drive.

Delete: Press this submenu key to display the "Delete Menu" on page 4-16 and a selection box that lists the contents of internal memory and an external drive if connected. Use the rotary knob or the **Up/Down** arrow keys to scroll to the file that is to be deleted and press the Select or De-Select submenu key, then Delete. Press the **Esc** key to cancel the operation. Note that deleted files cannot be recovered.

Figure 4-6.   File Menu

Save Menu

Key Sequence: **Shift** > **File (7)** > Save

Save	
Restore Default Quick Name Buttons	**Restore Default Quick Name Buttons:** Press this submenu key to undo any Quick Names previously entered and return all Quick Name buttons to factory defaults.
Change Quick Name	**Change Quick Name:** Press this submenu key to change the Quick Names at the bottom of the touch screen keyboard (see Figure 4-8). Select the Quick Name to edit, then press **Enter**. Type the new Quick Name and press **Enter** again. The new Quick Name is displayed on the button below the keyboard.
Change Save Location	**Change Save Location:** Press this submenu key to open the "Save Location Menu", where you can set the location of the destination file for saved data.
Change Type Setup/JPEG/...	**Change Type:** Press this submenu key to open the Select File Type list box and the "File Type Menu".

Figure 4-7.   Save Menu

Figure 4-8.   Save Dialog Box

File Type Menu

Key Sequence: **Shift** > **File (7)** > Save > Change Type

File Type JPEG Capture <u>Full</u> Graph Only	**JPEG Capture** **Full Graph Only:** Press this submenu key to toggle between file types, Full and Graphic Only. Choose Full to include all of the additional data on the measurement screen. Choose Graph Only to capture just the measurement trace in the sweep window.

Figure 4-9.   File Type Menu

Save Location Menu

Key Sequence: **Shift** > **File (7)** > Save > Change Save Location

Save Location Sort By <u>Name</u> Date Type Sort Order <u>Asc</u> Desc Create Folder Set Location Refresh Directories	This menu and dialog box are used to select the destination folder where Save files will be stored. Use the touch screen, the **Up/Down** arrow keys, or the rotary knob to select a folder in the Select Save Location dialog. To expand a folder and view its subfolders, press **Enter** or the **Right** arrow key. Press **Enter** again or the **Left** arrow key to collapse the folder. **Sort By** **Name Date Type:** Press this submenu key to sort the folders by Name, Type, or Date. **Sort Order** **Asc Desc:** Display the folder names in ascending or descending order. **Create Folder:** Press this submenu key to create a new folder in the selected location or folder. Enter the new directory name in the Create Directory dialog and press **Enter**. To return to the Select Save Location dialog without creating a new folder, press **Esc**. **Set Location:** Press this submenu key to set the currently selected location or folder as the destination where Save files will be stored, and to return to the "Save Menu" on page 4-9. Press **Esc** to exit without saving. **Refresh Directories:** Press this key to update the display.

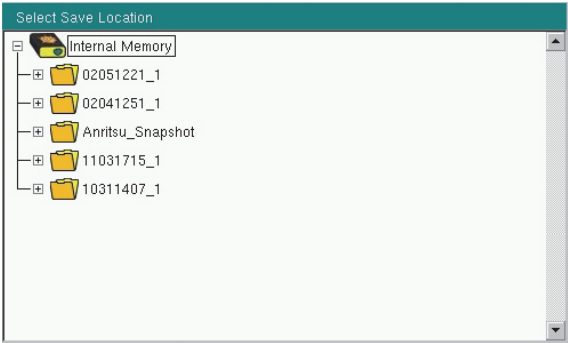**Figure 4-10.**   Save Location Menu

Figure 4-11.   Select Save Location Dialog Box

Save On Event Menu

Key Sequence: **Shift** > **File (7)** > Save On Event

Save On...
 	
 ...Crossing Limit
 	
 On   Off
 	
 ...Sweep Complete
 	
 On   Off
 	
 Save Then Stop
 	
 On   Off
 	
 Clear All
 	
 Back
 ←
	This menu is not available in all modes of operation. The menu is used to auto save measurements to the current save location after one of the following events:
	
	 ...Crossing Limit
	 On Off: Toggle this submenu key to On in order to save the measurement to the current save location when the measurement has crossed a defined limit line, created with the **Limit** menu.
	
	 ...Sweep Complete
	 On Off: Toggle this submenu key to On in order to save the measurement to the current save location after the current sweep is complete. If **Save Then Stop** is toggled Off, then a measurement is saved after every sweep.
	
	 Save Then Stop
	 On Off: Set this key to On to stop the sweep after a measurement is saved. With this key Off and **Sweep Complete** On, a measurement is saved after every sweep.
	
	 Clear All: Press this key to turn Off the three save on event keys:
	
	      Crossing Limit
	
	      Sweep Complete
	
	      Save Then Stop
	
	 Back: Press this key to return to the "File Menu" on page 4-8.

Figure 4-12. Save On Event Menu

Recall Menu

This menu and the dialog box shown in Figure 4-14 on page 4-13 are used to navigate folders and select files to recall to the Spectrum Master. Select folders or files with the **Up/Down** arrow keys, the rotary knob, or the touch screen.

Key Sequence: **Shift** > **File (7)** > Recall

Recall
Sort By
Name   Date   Type
Sort Order
Asc   Desc
File Type
ALL
Refresh
Directories

Sort By: Press this submenu key to sort file and folders by the file name, by the type of file, or by the date that the file or folder was saved.

Sort Order: Displays the folder or file in ascending or descending order based on the selection in the Sort By key.

File Type: Press this submenu key to display the Select File Type list box and the "File Type Menu" on page 4-10. To select the type of file you want to recall, use the touch screen, the **Up/Down** arrow keys, or the rotary knob to highlight the file type in the Select File Type list box, then press **Enter**. Alternatively, you can select the file type from the drop down menu in the Recall dialog.

The selectable file types vary with the instrument mode. Some examples of file types are:

> **Setup:** Setup files contain basic instrument information, measurement mode setup details, measurement marker data, and limit data.

> **Measurement:** Measurement files contain all of the information in the setup files and the measurement data.

> **Measurement & JPG:** Measurement files contain all of the information in the setup files and the measurement data, along with the saved display.

> **Limit Lines:** The Limit Lines file contains limit line data details.

> **Spurious Emission Mask:** The Spurious Emission Mask file contains the frequency, amplitude, and other information related to segments in an out-of-band spurious emission mask.

> **ALL:** Displays all file types.

Refresh Directories: Press this key to update the display.

Figure 4-13. Recall Menu

Recall Dialog Box

Select folders or files with the **Up/Down** keys, the rotary knob, or the touch screen. To expand a highlighted folder, press **Enter** or the **Right** arrow key. Press **Enter** or the **Left** arrow key to collapse.
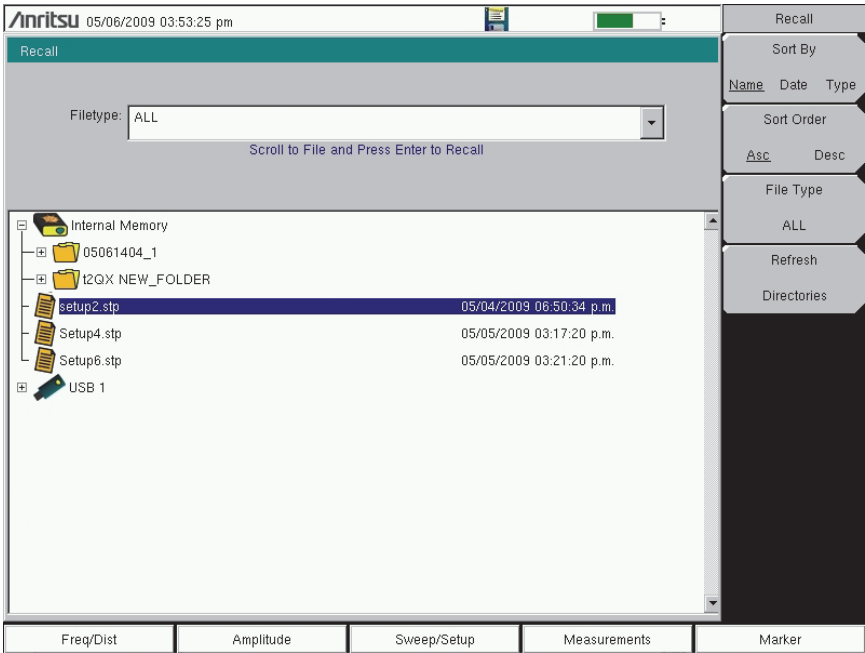

Figure 4-14. Recall Dialog Box

Copy Menu

This menu and dialog box are used to copy folders and files. Select folders or files with the **Up/Down** keys or the rotary knob. Figure 4-16 on page 4-15 shows the Copy dialog box with two JPEG images selected and ready to be copied to the USB flash drive. Highlight a folder, then press **Enter** or the **Right** arrow key to view its contents.

Key Sequence: **Shift** > **File (7)** > Copy

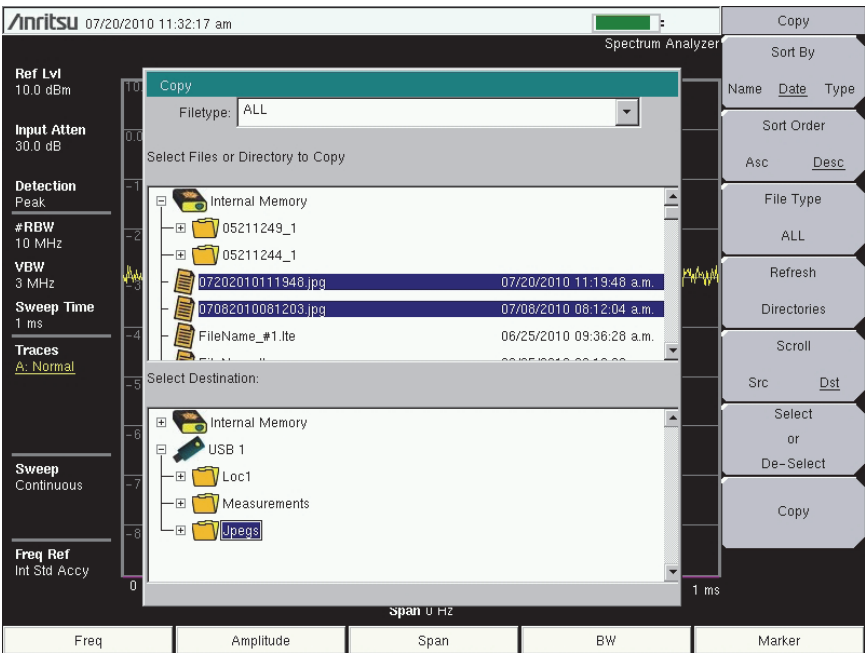|	
Copy Sort By Name Date Type Sort Order Asc Desc File Type ALL Refresh Directories Scroll Scr Dst Select or De-Select Copy	**Sort By** **Name Date Type:** Press this submenu key to sort file and folder lists by name, by type of file, or by the date that the file was saved. **Sort Order** **Asc Desc:** Press this submenu key to display the folders or files in ascending (**Asc**) or descending (**Desc**) order based on the selection in the **Sort By** key. **File Type:** Press this submenu key to select the type of files to view for copying. The file type can be changed with the **Up/Down** keys or the rotary knob, or by using the touch screen. Press **Enter** to make the selection. For more information about file types, refer to "File Types" on page 4-1. **Refresh Directories:** Press this key to update the display. **Scroll** **Src Dst:** Press this submenu key to use the scroll function in either the Source Window (**Src** - top pane) or the Destination Window (**Dst** - bottom pane). See Figure 4-16. **Select or De-Select:** Use this key to select or deselect the files or folders to be copied. When selected, a file or folder is highlighted in blue (see Figure 4-16). **Copy:** Press this submenu key to copy the files or folders that are selected in the top pane to the destination that is selected in the bottom pane. A dialog box is displayed when the copy function is complete. If a file with the same name exists in the destination folder, then a warning box is displayed to allow file overwrite or to allow cancel.

Figure 4-15. Copy Menu

Copy Dialog Box

Figure 4-16. Copy Dialog Box

Delete Menu

Key Sequence: **Shift** > **File (7)** > Delete

	This menu and dialog box are used to delete folders and files. Select folders or files with the **Up/Down** keys or the rotary knob.

```
┌─────────────────┐
│      Delete      │
├─────────────────┐
│     Sort By      │
│                  │
│ Name  Date  Type │
├─────────────────┐
│    Sort Order    │
│                  │
│ Asc        Desc  │
├─────────────────┐
│    File Type     │
│                  │
│       ALL        │
├─────────────────┐
│     Select       │
│       or         │
│   De-Select      │
├─────────────────┐
│     Delete       │
│                  │
├─────────────────┐
│    Refresh       │
│                  │
│   Directories    │
└─────────────────┘
```

Sort By: Press this submenu key to sort files and folders by name, by the type of file, or by the date that the file or folder was saved.

Sort Order: Displays the folder or file in ascending or descending order based on the selection in the Sort By key.

File Type: Press this submenu key to select what type of file view for deleting. The options are the ALL, Measurement, Setup, Limit Lines, or JPEG. The file type can be changed with the **Up/Down** keys or the rotary knob. Press **Enter** to make the selection.

For more information about file types, refer to "File Types" on page 4-1.

Select or De-Select: Use this key to select or deselect the file(s) or folder(s) to be deleted. When selected, a file or folder will be outlined in blue.

Delete: Press this key to open the Delete dialog box. Press **Enter** to delete the selected item or **Esc** to Cancel.

Refresh Directories: Press this key to update the display.

Figure 4-17. Delete Menu

Delete Dialog Box
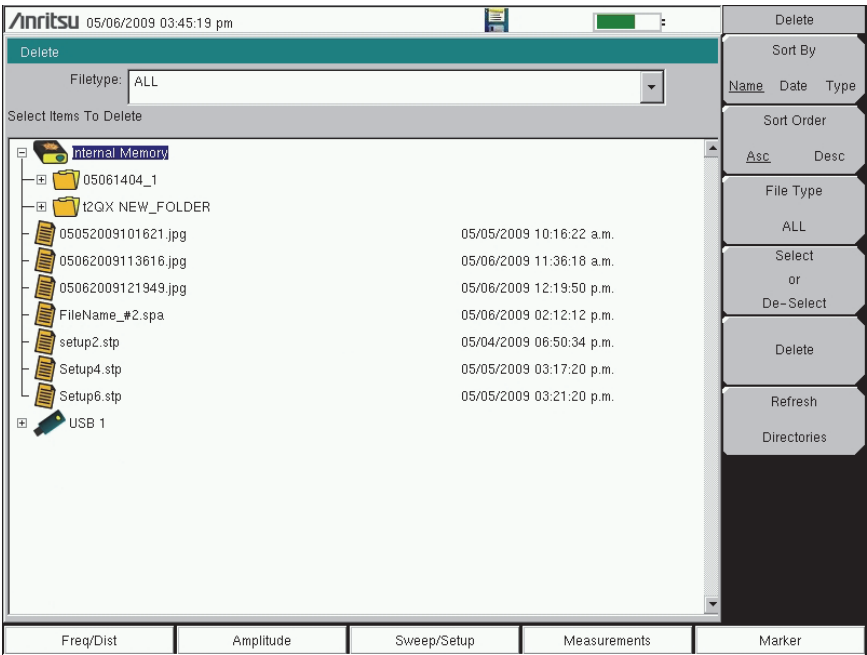
Figure 4-18. Delete Dialog Box

Chapter 5 — System Operation

5-1   Introduction

This chapter reviews the Spectrum Master system operations.

The other menus (Sweep, Measure, Trace, and Limit) are described in the Measurement Guides that are listed in Appendix A.

5-2   System Menu Overview

To access the functions under the System menu, press the **Shift** key, then the **System** (**8**) key. Figure 5-1 and Figure 5-2 show the menu group that is accessible from the System menu. Menu maps typically display all possible submenu keys, although some keys are displayed on the instruments only under special circumstances (refer to the menu descriptions on the following pages).

Note that the menus that are indicated by numbered circles are shown in Figure 5-2.

System Menu Map 1
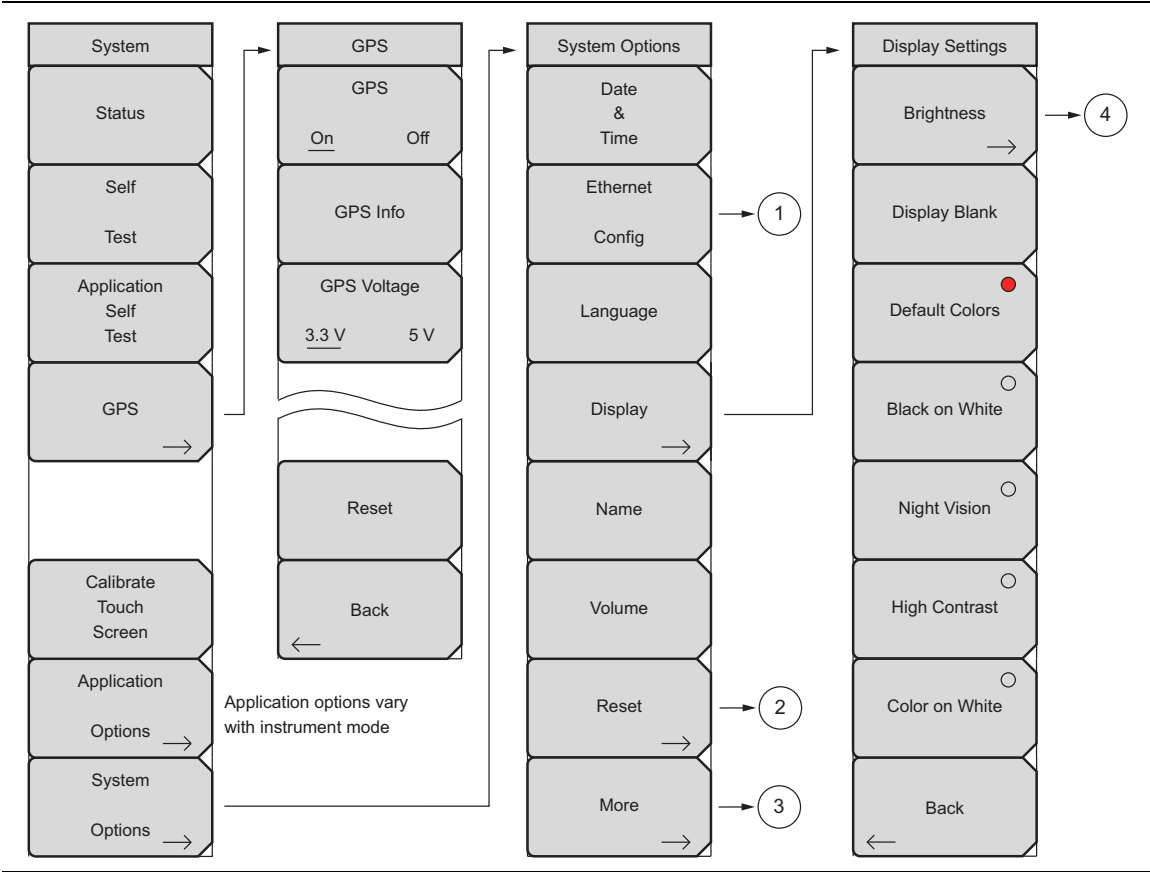
Figure 5-1.   System Menu Map – Part 1

System Menu Map 2
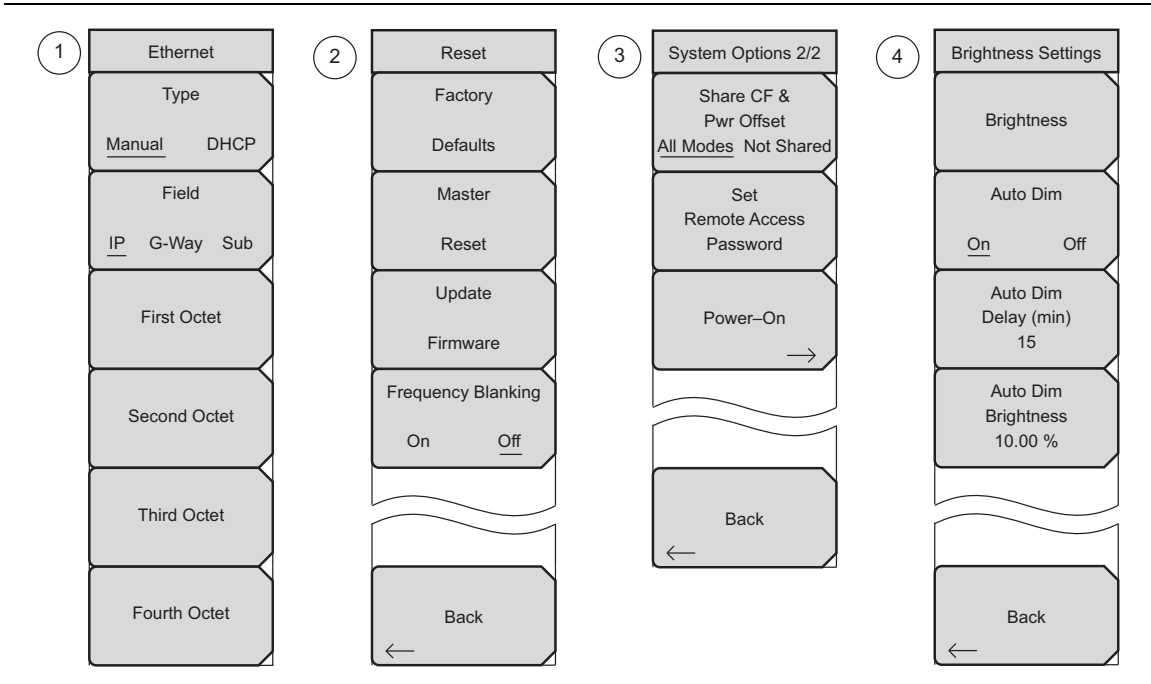
Figure 5-2.   System Menu Map – Part 2

5-3   System Menu

Key Sequence: **Shift** > **System** (**8**)

System **Status** **Self** **Test** **Application** **Self** **Test** **GPS** → **Calibrate** **Touch** **Screen** **Application** **Options** → **System** **Options** →	**Status:** Press this submenu key to display 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:** Press this submenu key to run a series of tests that are related to the performance of the motherboard hardware. Press the **Esc** key to abort, or press the **Enter** key to continue. The display lists a summary of those tests that have passed. If any test fails, then all of the performed tests are listed with Pass/Fail notification. If the Self Test fails when the battery is fully charged and the instrument is within the specified operating temperature, contact your Anritsu Service Center (refer to "Contacting Anritsu for Sales and Service" on page 1-2) and report the test results. Press **Esc** or **Enter** to return to normal operation. **Application Self Test:** Press this submenu key to run a series of tests that are related to the performance of the instrument hardware and that are specific to the current instrument mode (refer to Section 2-8 "Mode Selector Menu" on page 2-18). Press the **Esc** key to abort, or press **Enter** to continue. The display lists a summary of those tests that have passed. If any test fails, all of the performed tests are then listed with Pass/Fail notification. In this case, contact your Anritsu Service Center and report the test results. Some of the hardware that is tested may also be used in multiple operating modes. One or more additional submenu keys may be displayed to allow other application self tests, depending on the installed options. For example, in an instrument model with the Tracking Generator option, when the test results are displayed, a **TG Self Test** submenu key is provided for an additional test. A Microwave Module Self Test is available with the 32 GHz and the 43 GHz Frequency options. **GPS:** Press this submenu key to open the GPS Menu. Refer to Chapter 6, "GPS (Option 31)" for additional information. **Calibrate Touch Screen:** Press this submenu key to begin touch screen calibration. **Application Options:** Submenu keys are specific to each measurement mode. Please refer to a specific Measurement Guide, as listed in Appendix A. **System Options:** Press this submenu key to open the "System Options Menu" on page 5-5.

Figure 5-3.   System Menu

Touch Screen Calibration

Touch screen calibration details and related features are described in "Touch Screen Calibration" on page 2-16.

System Options Menu

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

System Options Date & Time Ethernet Config Language Display → Name Volume Reset → More →	**Date & Time:** Press this submenu key to display a dialog box for setting the current date and time. Use the submenu 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. Press **Enter** to accept the changes, or press the **Esc** key to return to normal operation without making changes. **Ethernet Config:** Press this submenu key to display the Ethernet submenu and to open the Ethernet Editor dialog box, where you can set the instrument IP address. For details, refer to "Ethernet Menu" on page D-2. **Language:** Press this submenu key to open a list box and select a built-in language for the instrument display. Press **Enter** to apply the change, or press **Esc** to cancel. The languages that are currently available are: English, French, German, Spanish, Japanese, Chinese, Korean, Italian, Russian, and Portuguese. You can edit non-English language captions using Master Software Tools (MST). If a mode does not have language translations available, then English is the default language. **Caution:** A firmware update or any instrument reset will overwrite modifications you may have made in any of the language files. **Display:** The Display submenu key opens the "Display Settings Menu", allowing brightness control and the selection of different display attributes. **Name:** Press this submenu key to open the Unit Name dialog, where you can enter a name for the instrument, using the touch screen keyboard. Press **Enter** to save the name. The assigned instrument name appears in measurement files, setup files, limit line files, and MST reports. It is displayed on the browser title bar when the instrument is connected to a remote PC or mobile device. **Volume:** Press this submenu key to set the speaker 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:** Press this submenu key to open the "Reset Menu" on page 5-10. **More:** Press this submenu key to open the "System Options 2/2 Menu" on page 5-6.

Figure 5-4.   System Options Menu (1 of 2)

System Options 2/2 Menu

Key Sequence: **Shift** > **System** (**8**) > System Options > More

System Options 2/2 Share CF & Pwr Offset <u>All Modes</u> Not Shared Set Remote Access Password Power–On $\longrightarrow$ Back $\longleftarrow$	**Share CF & Pwr Offset** **All Modes Not Shared:** Press this submenu key to toggle the setting between All Modes and Not Shared. Select All Modes to have the current center frequency setting and power offset setting carried over when changing measurement modes. This function is not applicable to measurements that do not have a center frequency or power offset setting or to measurements in which the current center frequency or power offset setting is outside the range of the new measurement. **Set Remote Access Password:** Press this submenu key to open the Password entry dialog (see Figure 5-6 on page 5-7). Use the touch screen keyboard to enter the new password. Passwords may contain digits, uppercase and lowercase letters, and the symbols - _ + . (hyphen, underscore, plus, period). Press **Enter** to save or **Esc** to cancel. Connecting to the instrument via Master Software Tools (v2.21.1 or later), Wireless Remote Tools (WRT), or the Web Remote Control browser interface will require the set password. An empty Password field means the instrument is not password-protected. The password is also removed following a Master Reset, Factory Defaults reset, or a firmware update. **Power–On:** Press this submenu key to open the "Power–On Menu" on page 5-7. **Back:** Press this submenu key to return to the "System Options Menu" on page 5-5.

Figure 5-5.   System Options Menu (2 of 2)

Warning	Do not set a remote access password when using SCPI commands to communicate with the instrument.
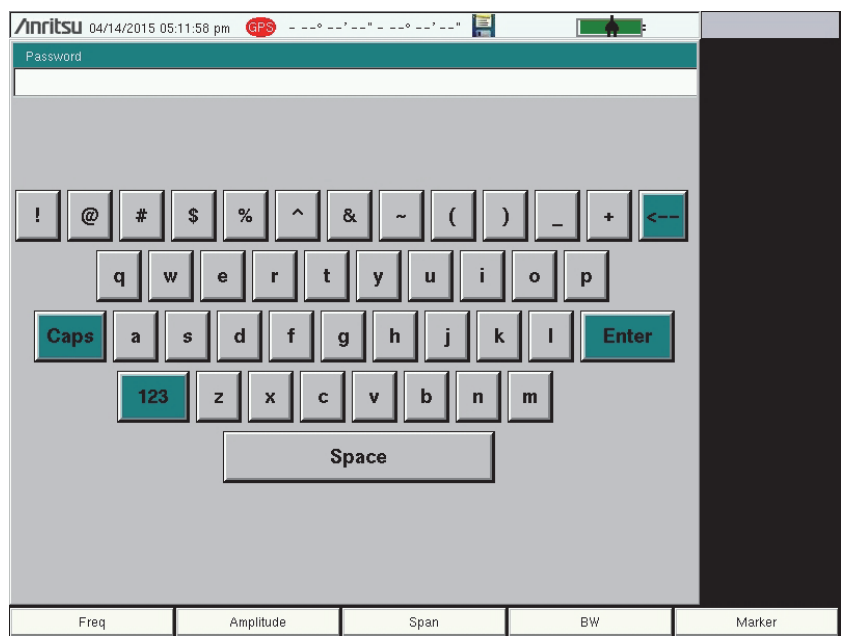
Figure 5-6.   Remote Access Password Dialog

Power–On Menu

Key Sequence: **Shift** > **System** (**8**) > System Options > More > Power–On

Power Switch: Press this submenu key to set the Spectrum Master for normal use of the On/Off button on the instrument front panel.

When DC Applied: Press this submenu key to set the Spectrum Master to automatically restart when DC power is applied to the External Power connector (item 5 in Figure 2-3 on page 2-4). Refer to "External Power On" on page 3-11.

Back: Press this submenu key to return to the "System Options 2/2 Menu" on page 5-6.

Figure 5-7.   Power–On Menu

Display Settings Menu

Key Sequence: **Shift** > **System** (**8**) > System Options > Display

Display Settings	
Brightness →	**Brightness:** Opens the "Brightness Settings Menu" on page 5-9.
Display Blank	**Display Blank:** Opens a note box. Press **Enter** to turn off the display, or press **Esc** to abort. When the display is off, turn on the display with three rapid key presses of any key except the power key (or turn instrument power Off and On).
● Default Colors	**Default Colors:** Sets the display colors to their factory default condition and is used for normal viewing. The measurement grid is black (or a shade of gray), and the background is black.
○ Black on White	**Black on White:** Sets the display colors to black (data) and white (background). This setting is used for printing and viewing in broad daylight conditions.
○ Night Vision	**Night Vision:** Sets the display to a red-tinted color (data) with a black background. The front panel keypad is backlighted in red. This setting is optimized for night-time viewing.
○ High Contrast	**High Contrast:** Increases the black and white contrast of the default display. This setting is used for challenging viewing conditions.
○ Color on White	**Color on White:** Sets the display background to white, the grid to gray, and leaves sweep data in color. This setting is used for printing and viewing in broad daylight conditions.
Back ←	**Back:** Press this submenu key to return to the "System Options Menu" on page 5-5.

Figure 5-8.   Display Settings Menu

Brightness Settings Menu

Key Sequence: **Shift** > **System** (**8**) > System Options > Display > Brightness

Brightness Settings

Brightness

Auto Dim

On   Off

Auto Dim
Delay (min)
15

Auto Dim
Brightness
10.00 %

Back

←

The brightness of the display can be adjusted to optimize viewing under a wide variety of lighting conditions.

Brightness: Press this submenu key to display the Brightness Editor window. Use the rotary knob (increment changes of 5), the **Up/Down** arrow keys (increment changes of 25), or the **Left/Right** arrow keys (0 or 100), to select a brightness level from 0 to 100, with 100 being the brightest. Press **Enter** to accept the change. All display elements on the instrument screen are affected by the Brightness setting.

Auto Dim On/Off: Press this submenu key to toggle the display auto-dimming feature on and off. Enabling auto-dim can extend battery life.

Auto Dim Delay: Press this key to adjust the amount of idle time, from 1 to 15 minutes, before the instrument display goes dim. Use the arrow keys or the rotary knob to adjust the value in increments of 1. You can also use the numeric keypad, then press **Enter**. Out-of-range values are ignored.

Auto Dim Brightness: Press this submenu key to select the brightness percentage level of the display when it is dimmed. Use the arrow keys or the rotary knob to adjust the value in increments of 5%, from 0% to 25%. You can also use the numeric keypad, then press **%** or the **Enter** key. Out-of-range values are ignored.

Back: Press this submenu key to return to the "Display Settings Menu" on page 5-8.

Figure 5-9.   Brightness Settings Menu

Reset Menu

Key Sequence: **Shift** > **System** (**8**) > System Options > Reset

| | **Factory Defaults:** Press this submenu key to restore the instrument to its factory default settings, including Ethernet, language, volume, and brightness settings. The instrument will power cycle as part of this operation. Press the **Enter** key to initiate the reset, or press **Esc** to abort. |

Reset

Factory

Defaults

Master

Reset

Update

Firmware

Frequency Blanking

On   Off

Back

←

> **Note:** This reset sequence can be initiated when turning the Spectrum Master On by pressing and holding the **Esc**+**On** keys until the Anritsu splash screen is displayed.

Master Reset: Press this submenu key to restore all instrument settings to factory defaults and to delete all user files from the instrument internal memory. The instrument will power cycle as part of this operation. Press the **Enter** key to initiate the reset, or press **Esc** to abort.

> **Note:** This reset sequence can be initiated when turning the Spectrum Master On by pressing and holding the **System** (**8**)+**On** keys until the Anritsu splash screen is displayed.

Update Firmware: Press this submenu key to update the instrument operating system using an external USB drive. Press **Load Firmware** to start the update procedure, or press the **Menu** key to cancel and display the Menu key screen of application icons. Refer to "Firmware Update" on page 5-12 for additional information.

Frequency Blanking On/Off (Option 7 Only)**:** The Frequency Blanking submenu is displayed only when Option 7, Secure Data Operation, is installed on the Spectrum Master. When Frequency Blanking is turned On, all frequency values that are displayed on the screen and menu buttons are replaced with ##.#####. This security measure allows the use of the instrument without sensitive frequency information being displayed on the screen.

Note that saved measurements retain the frequency information, which may then be viewed on a PC, or recalled after frequency blanking is turned off.

Setting Frequency Blanking to Off will preset the instrument settings and frequencies to the factory default settings (the current frequency settings will not be saved or displayed on the instrument).

Back: Press this submenu key to return to the "System Options Menu" on page 5-5.

Figure 5-10. Reset Menu

Caution	A Factory Defaults reset or Master Reset will require that you reload any custom language files via Master Software Tools.

5-4   Preset Menu

Key Sequence: **Shift** > **Preset** (**1**)

Preset	**Preset:** This key resets the instrument to the default starting conditions.
Preset	
Save	**Save Setup:** Opens the Save 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.
Setup	
Recall	**Recall Setup:** This key allows the selection and recall of a previously stored instrument setup. All current instrument settings are replaced by the stored setup information.
Setup	

Figure 5-11. Preset Menu

5-5   Self Test

At power on, the Spectrum Master runs through a series of quick checks to ensure that the system is functioning properly. The System Self Test runs a series of tests that are related to the instrument hardware. The Application Self Test runs a series of tests related to the instrument hardware that is used in the current operating mode.

Some Application Self Tests include further tests, which are indicated by additional submenu keys. For example, after a spectrum analyzer application self test in a Spectrum Master with the Tracking Generator option, a Tracking Generator Self Test submenu key is displayed. In Spectrum Masters with the 32 GHz or the 43 GHz frequency option (MS2720T-0732 or MS2720T-0743), a self test is available for the RF down converter module.

If the Spectrum Master is within the specified operating range with a charged battery and the self test fails, contact your Anritsu Service Center.

To initiate a self test when the system is already powered up:

   1. Press the **Shift** key and then the **System** (**8**) key.

   2. Press the Self Test submenu key. The Self Test results are displayed.

   3. Press the **Esc** key to close the Self Test results dialog.

Also refer to **Self Test** and **Application Self Test** in "System Menu" on page 5-4.

5-6   Firmware Update

To update the firmware in your Spectrum Master, download the firmware upgrade file from the Anritsu website, then use a USB memory stick to transfer the files from your PC to the instrument.

The minimum requirements for firmware update are:

- personal computer with Internet access
- your Spectrum Master, powered with an AC adapter
- a USB memory stick with at least 128 MB of free space

Note	Anritsu recommends reformatting your USB memory stick before using it for firmware upgrade.

Firmware Download

You can find the link to the firmware download page for your instrument model by navigating to either the specific product page or the firmware update page for the related instrument family.

Product Page

1. Open the Anritsu Web page with your browser.

   http://www.anritsu.com

2. Enter your instrument model number in the Search field. See Figure 5-12.

Figure 5-12. Anritsu Web Page Search Field

3. Click the appropriate instrument link on the search results page.

4. On the product page, click the Library tab.

5. In the Drivers, Software Downloads section of the product Library page, click the link "Firmware Update for the Spectrum Master MS2720T".

6. Click the **Download** button and save the executable file to your PC.

7. Insert the USB memory stick into a USB port on your PC.

8. Double-click the downloaded executable file, then copy the extracted contents to the USB drive. Alternatively, you may execute the file *after* copying it to the USB drive.

   The instrument will not detect the firmware on the USB memory stick unless the executable file is unzipped.

9. Remove the USB memory stick from the PC.

10. Proceed to "Loading Firmware".

Firmware Updates Page

1. Open the Spectrum Master Firmware Updates page with your browser.

http://www.anritsu.com/en-US/Products-Solutions/Products/SPA-Firmware.aspx

2. Click the Spectrum Master tab.

3. In the Firmware Update (USB Method) column, click the Download Now link that corresponds to your instrument model.

4. Continue with Step 6 above to download the firmware upgrade file.

Loading Firmware

These instructions assume you have downloaded the firmware update file and extracted its contents to a USB memory stick. Refer to "Firmware Download" on page 5-12.

1. Turn off the instrument you wish to upgrade.

2. Insert the USB memory stick into a USB port on the instrument.

3. Make sure the instrument is plugged into an AC power source, using an approved adapter. This is to prevent unrecoverable errors that may result from a depleted battery while the firmware upgrade is in progress.

4. Turn on the instrument.

5. Following bootup, the Automatic Update dialog opens. Press the Yes submenu key, then skip to Step 7.
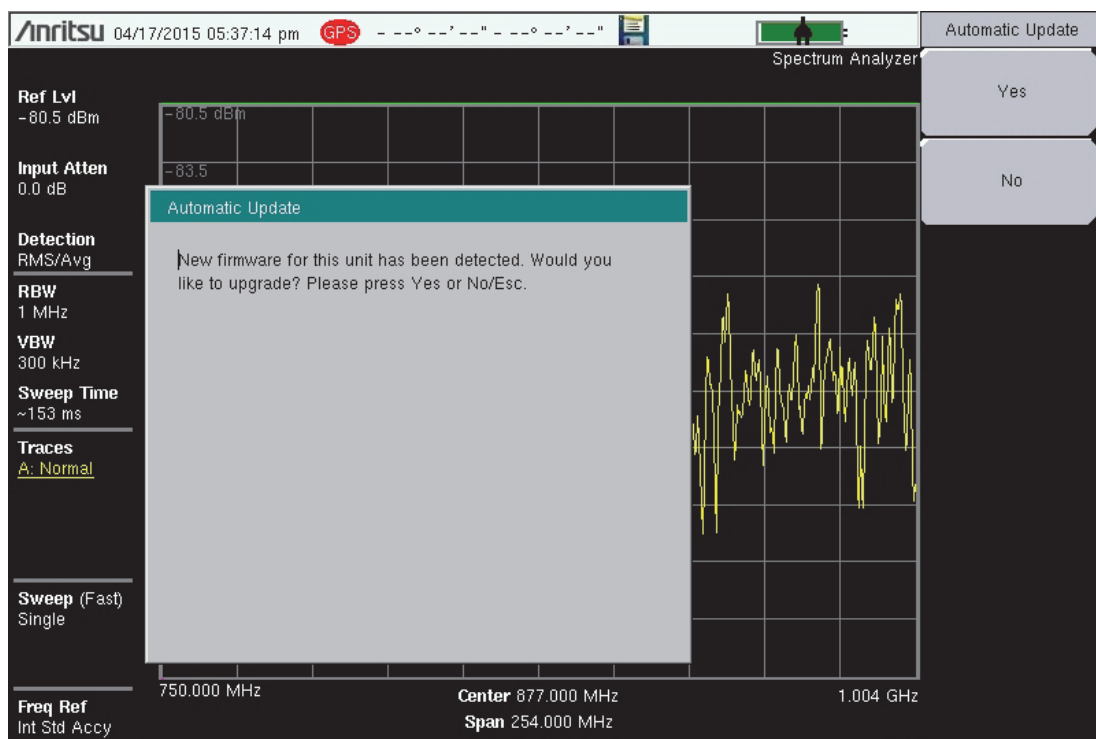
Figure 5-13. Automatic Update Dialog

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6. If the Automatic Update dialog does not display, proceed with the following steps.

    1. Press **Shift**, then **System** (**8**) on the instrument front panel.

    2. Press the System Options submenu key.

    3. Press the Reset submenu key.

    4. Press the Update Firmware submenu key.

    5. Press the **Load Firmware** main menu key.

    6. Press the Update Application Firmware submenu key.

7. In the Automatic Firmware Update dialog, select whether you want to save any user data. You can use the **Up/Down** arrow keys or the rotary knob.

Figure 5-14. Automatic Firmware Update Dialog

- Save none: No attempt will be made to save any user data.
- Save user data: User data will be saved to the selected external media device.
- Save & restore user data: User data will be saved to the selected external media device. The instrument will also attempt to restore the files to the instrument after the update.

Warning	If there is not enough free space on the external drive, some user data will be lost.

8. Press **Enter**.

9. Press the **Enter** key again to confirm that you want to upgrade the instrument's firmware.

10. After all of the files have been updated, the instrument will reboot.

Adding Options with a License File

Purchasing an option requires the Spectrum Master model number, serial number, and auxiliary serial number. Provide this information to Anritsu Customer Service when you place your order. Customer Service will advise you whether the option qualifies for enabling via a license file. Only option retrofits that do not require additional hardware or calibration qualify for enabling via a license file. If applicable, Customer Service will send you a license file via e-mail or secure FTP. Copy that license file to a USB memory device and enable the option in your Spectrum Master.

1. To determine the serial number, press **Shift**, then **System** (**8**) to display the System menu.

2. Press the Status submenu key and find the Serial Number and Auxiliary Serial Number in the displayed list.

3. Contact Anritsu Customer Service to arrange purchase of the option.

To install a license file onto an instrument, you must load it onto a blank USB memory device. Anritsu recommends that you format the USB memory device before loading the file.

Use the following procedure to enable an option on your Spectrum Master:

1. When you receive the "MS2720T xxxxxxx.license" file, where "xxxxxxx" is the instrument serial number, copy that file to a blank USB memory device.

2. With the Spectrum Master off, place the USB memory device into the USB Interface (Type A). See Figure 2-2 on page 2-3 for a description of the top panel connectors.

3. Turn on the Spectrum Master. The instrument proceeds with the normal boot process and automatically installs the license file. A message is displayed to indicate that the options were changed and that you must restart the Spectrum Master.

4. Turn off the Spectrum Master, remove the USB memory device, and turn on the Spectrum Master.

5. The instrument is ready for use with the new option enabled.

Chapter 6 — GPS (Option 31)

6-1   Introduction

The Spectrum Master MS2720T is available with a built-in GPS receiver feature (Option 31) that can provide latitude, longitude, altitude, and UTC timing information. When GPS is actively locked to satellites, this information is saved with all saved measurements and can be displayed with Master Software Tools. The GPS option may enhance the instrument's base frequency reference oscillator accuracy if Option 1 is not installed. If Option 1 is installed, it is used to improve frequency accuracy while GPS is used for location.

6-2   Setting Up GPS (Option 31)

In order to acquire data from the GPS satellites, you must have line-of-sight to the satellites, or the antenna must be placed outside without any obstructions. In addition to having Option 31 installed, the Spectrum Master requires a GPS antenna. Refer to the MS2720T Technical Data Sheet for compatible GPS antennas.

Activating the GPS Feature

1. Attach the GPS antenna to the GPS Antenna connector on the top of the instrument.

2. Press the **Shift** key then the **System** (**8**) key on the numeric keypad to display the System menu.

3. Press the GPS submenu key to display the GPS menu.

4. Activate GPS by pressing the GPS, On/Off submenu key so that On is underlined. When GPS is first turned On, the GPS icon is displayed in red to indicate that fewer than four satellites are currently being tracked.

GPS

Figure 6-1.   GPS Icon, Red

5. Press the GPS Info submenu key to open the GPS Info window, which displays:

- Tracked Satellites
- Latitude
- Longitude
- Altitude
- UTC timing information
- Fix available
- Almanac Complete
- Antenna Status
- Receiver Status
- GPS Antenna current and voltage

6. When the GPS receiver is tracking at least four satellites, the GPS icon changes to green.

Figure 6-2.   GPS Icon, Green

Note	The GPS option may enhance the instrument's base frequency reference oscillator accuracy only when Option 1 is not installed. If Option 1 is installed, it is used to improve frequency accuracy while GPS is used for location.
	After GPS lock, it may take a few minutes before the Ref Freq status changes to GPS High Accuracy in the Status menu, which is displayed on the left side of the measurement display.
	To reset the GPS, press the Reset submenu key. The green GPS icon (tracking four or more satellites) shows a red crossmark when satellite tracking is lost. See Figure 6-3.

Figure 6-3.   GPS Icon, Green with Red Cross

After GPS location fix is attained and when Option 1 is not installed, the internal reference oscillator begins to correct its frequency to match the GPS standard. After the internal frequency is adjusted to match the GPS standard, the status is indicated by "GPS High Accuracy" showing in the Status menu, which is displayed on the left side of the measurement display. When the GPS feature is not enabled, the reference source displays either "Internal Standard Accuracy" or a user-selected external reference frequency in the Status menu.

Within three minutes of satellite acquisition, the reference oscillator will have an accuracy of better than 25 ppb (parts per billion). The OCXO internal standard accuracy is ±0.3 PPM. The correction factor applied to the internal OCXO allows the instrument to maintain GPS frequency accuracy for three days at better than 50 ppb, even when the instrument is obstructed from receiving signals from the GPS satellites.

In order to acquire data from the GPS satellites, you must have line-of-sight to the satellites, or the antenna must be placed outside with no obstructions.

If no GPS is connected for at least three days, the Frequency Reference annotation reads Int Std Accy.

When GPS is connected, with a fix, and the tuning process has completed (which may take a few minutes), the Frequency Reference annotation shows GPS Hi Accy. If GPS is subsequently lost (for example, GPS is turned off, disconnected, or there is no signal due to physical obstruction), the instrument goes back to Int Hi Accy after a few moments. If GPS remains disconnected for three consecutive days, whether the instrument is on or off, the instrument reverts to Int Std Accy.

6-3   GPS Menu

Key Sequence: **Shift**, **System** (**8**) > GPS

GPS: Press this submenu key to turn GPS On or Off.

GPS Info: Press this submenu key to open the GPS INFO list box to display the current GPS information. Refer to "GPS Info" on page 6-4.

GPS Voltage: Press this submenu key to set the source voltage to be either 3.3 V or 5 V, depending on the GPS receiver being used. GPS antenna voltage is set to 3.3 V by default in order to prevent accidental damage to lower-voltage GPS antennas.

Reset: This key resets the number of tracked satellites to 0 and erases any almanac data and saved coordinates. The process of searching for and reacquiring satellites will begin again.

Back: Press this key to return to the "System Menu" on page 5-4.

Figure 6-4.   GPS Menu

GPS Info

Tracked Satellites: Shows the number of tracked satellites (three are required to retrieve latitude and longitude, four are required to resolve altitude). Generally, the larger the number of satellites tracked, the more accurate the GPS information.

Latitude and Longitude: Shows location in degrees, minutes, and seconds.

Altitude: Shows altitude information in meters.

Fix Available: The cold start search sets are established to ensure that at least three satellites are acquired within the first couple of minutes. When the three satellites are found, the receiver computes an initial fix (typically in less than two minutes). **Fix Available**:   **No** means that the initial position has not been established.

Almanac Complete: The system Almanac contains information about the satellites in the constellation, ionospheric data, and special system messages. In a cold start, the GPS receiver does not have any navigation data, so the receiver does not have a current almanac. A complete system almanac is not required to achieve a first position fix. However, UTC time is not correct until the almanac is complete, and the availability of the almanac can significantly reduce the time to first fix.

Antenna Status: OK and SHORT/OPEN Detected or Passive Antenna Used

- **OK:** Active antenna is connected and is working properly.

- **Antenna SHORT/OPEN Detected or Passive Antenna Used:** If an active antenna is in use, a short or open exists between the antenna and the connection. If this message is displayed, then remove and replace the active GPS antenna. If the message persists, then try another Anritsu GPS antenna. If the message persists, contact your nearest Anritsu Service Center (refer to "Contacting Anritsu for Sales and Service" on page 1-2). If a passive antenna is in use, the message should display: Antenna OPEN Detected or Passive Antenna Used.

Receiver Status: Current status of the receiver.

GPS Antenna Voltage and Current: Shows voltage and current.

Chapter 7 — Atomic Clock (Option 1)

7-1 Introduction

The Spectrum Master MS2720T is available with an internal atomic clock that delivers greatly improved frequency accuracy over the instrument's standard reference signal. This option can be combined with GPS, Option 31, to deliver both excellent frequency accuracy along with location information.

7-2 Overview

No activation is required to use the internal atomic clock. If the option is installed in the instrument, it will automatically be used as the frequency reference. The status of the internal atomic clock is shown in the lower left side of the display. Under Freq Ref (Frequency Reference), the following annotations provide the status of the Chip Scale Atomic Clock:

- CSAC Warm Up indicates that the clock is still warming up and not within specification.
- CSAC Int indicates that the clock is warmed up and is meeting specification.

Note	When the instrument is switched between measurement modes, the status will indicate "CSAC Warm Up" for a few seconds as the new measurement mode is initialized.
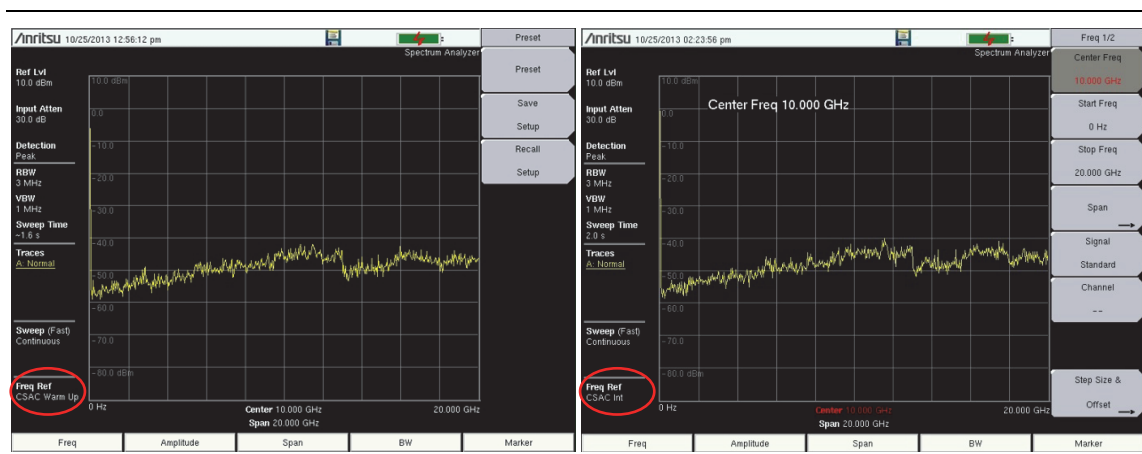
Figure 7-1. Atomic Clock Status Messages

7-3 Warm-up Time

At room temperature, approximately three minutes warm-up time is required to meet specifications. Up to 10 minutes warm-up time may be needed when the instrument is very cold or very warm. There may be small frequency transient effects when the instrument is moved through large ambient temperature changes.

Chapter 8 — Anritsu Tool Box

8-1   Introduction

The Anritsu Tool Box is a suite of applications that provide an interface between Anritsu handheld RF instruments and a PC. The instrument connects to the computer via a USB, Ethernet, or serial port. Depending on the application selected, available functions range from the capture, transfer, and reporting of measurement data for trace analysis, to map preparation, creation and delivery of work instructions, and remote instrument monitoring and control.

The Tool Box may be installed from the Anritsu software DVD or you can download individual applications from the Anritsu website at www.anritsu.com/en-US/Services-Support/Handheld-Tools-Tool-Box.aspx

This chapter gives an overview of the software installation DVD and the main features of each application in the Anritsu Tool Box.

8-2   Software Installation DVD

Place the software disc in the DVD drive on your PC and follow the on-screen instructions. The Setup Wizard welcome screen illustrated in Figure 8-1 may change with the software version.

You will be asked to select which applications you wish to install. Not all instrument models are supported by every software tool. Visit the web page referenced in the *Introduction* section above and follow the links for more information on a specific tool.
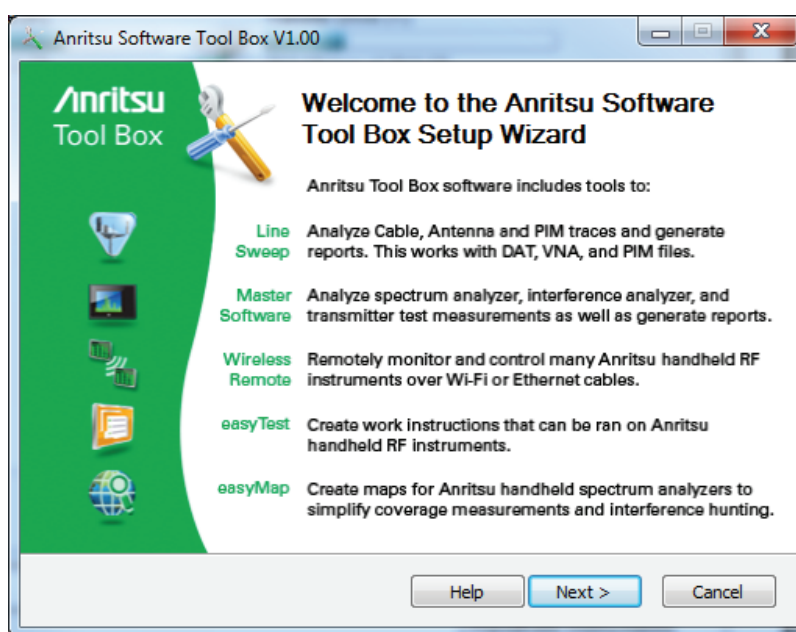
Figure 8-1.   Anritsu Tool Box Setup Wizard

If the installer does not autostart, open the DVD in Windows Explorer and double-click the executable setup file. See Figure 8-2.
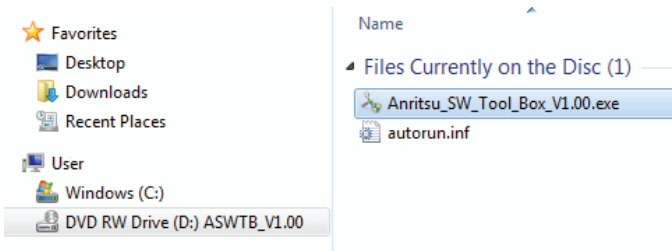
Figure 8-2.   Tool Box Installer on the Anritsu Software DVD

8-3   Anritsu Software Tool Box

The Anritsu Tool Box serves as a central location from which you can open a previously saved measurement, visit the Anritsu website, or launch an application. To open the Tool Box, either double-click the desktop shortcut or select the Tool Box from the Windows Start menu, under All Programs and the Anritsu folder. On the Tool Box screen, hover the mouse pointer over any of the application icons to view a short description of the application. See Figure 8-3.

Figure 8-3.   Anritsu Tool Box Screen

8-4   Software Tools

The Anritsu Tool Box provides links to the software tools installed on your PC. Alternatively, you can launch an application using its desktop shortcut or through the Windows Start menu.

The following sections list the top features and functions of the tools contained in the Anritsu Tool Box that are compatible with the Spectrum Master MS2720T. For a detailed description of these features and how to perform specific tasks, refer to each application's Help system. The program Help also lists the instrument models, measurement modes, trace types, and file types that are compatible with that application.

Master Software Tools (MST)

Master Software Tools is designed for users of Anritsu handheld spectrum analyzers, interference analysis tools, transmission testers, and backhaul testers. Supported functions include the following:

- Transfer of captured measurement data to and from a PC for storage and analysis
- RF Spectrum Analyzer traces
- RF Interference analysis
- Spectrum monitoring
- Transmitter signal quality tests
- T1, T3, and E1 backhaul tests
- Trace overlay features for comparing multiple Spectrum Analyzer measurements
- Limit lines and markers
- Script Master for the creation of automated test procedures
- Export of measurement data as text, graphic, or Comma Separated Value format (CSV) files
- Reports created in HTML format for use in other applications

easyTest Tools

easyTest Tools is used to create work instruction files that consist of a command sequence and intructions to help less experienced personnel with operating the instrument in the field.

- A drag-and-drop tool facilitates the creation of a test sequence from a library of commands.
- Instructions can be a mix of textual prompts and graphic images.
- Sample procedure files (.ett) are included with easyTest Tools.
- Command sequences are delivered electronically and loaded on the instrument, where they are recalled with a press of a button.
- Recall Setup places the instrument in the proper mode for the measurement by retrieving saved parameters such as measurement type, frequency and amplitude settings, markers and limit lines.
- The current measurement setup or the screen display can be saved manually or automatically.

easyMap Tools

easyMap Tools is the new name for Anritsu Map Master. The application allows users to find and prepare geo-referenced maps and to build floor plans suitable for Anritsu Handheld Spectrum Analyzers with Interference Analysis or Coverage Mapping capabilities (Option 25 or Option 431, respectively).

Software functions include:

- Creation of geo-referenced maps with pan and zoom capability
- Conversion of maps and floor plans to a form suitable for use on Anritsu Handheld Spectrum Analyzers and Interference Analyzers
- Introduction of GPS information into previously non-geo-referenced maps

Wireless Remote Tools

Wireless Remote Tools enables the user to remotely monitor and control the instrument over a wireless LAN connection.

- The wireless connection is typically established using a USB-powered Wi-Fi router attached to the instrument and a matching Wi-Fi link on the PC end.
- Remote monitoring and control of the instrument enhance operator safety and efficiency when conditions make it unsafe or impractical to be close to the instrument.

Chapter 9 — Web Remote Control

9-1 Introduction

Web Remote Control capabilities are embedded in the Spectrum Master, providing full instrument control through an HTML-5 compatible browser. The ability to remotely monitor and control the instrument from the ground or desk enhances operator safety and efficiency when conditions make it unsafe or impractical to be close to the instrument.

A remote connection terminates when the user logs out or closes the browser. Passwords can be used to manage multiple-user access to the same instrument.

To prevent multi-user conflicts, only one connection is permitted at a time. A second user who tries to take control of the instrument will be denied on his or her first access attempt. If a second attempt is made after one minute has passed, the first user session is terminated and another session started for the new user. This prevents an idle user from blocking access to the instrument.

While only one user can have control of the instrument, multiple users can view the same instrument using a desktop sharing application.

9-2 Setup

You can connect one or more instruments, through direct connection, a LAN, or portable router, to any device with an HTML-5 browser. Current versions of Google Chrome and Mozilla Firefox are supported. The device may be a laptop, a desktop computer, or a mobile device, including a wide range of tablets and smart phones running Android or iOS operating systems. Note that you cannot download files to an iOS device, for lack of a user-accessible file system in this environment.

Physical connection is established from the instrument's Ethernet port directly to the computer, or to a LAN or a portable Wi-Fi router such as the ZyXEL MWR102 Portable Router.

LAN Connection

1. Connect the Ethernet port of the Spectrum Master to your LAN.

2. Press **Shift** followed by **System** (**8**).

3. Press the Status submenu key to display the Status window and take note of the instrument IP address.

   Press **Esc** to close the Status window.

4. If no IP address has been assigned, refer to Appendix D, "LAN and DHCP" for information on setting an IP address for the instrument. If connecting to another network, we recommend that you request a static IP address from your network administrator to avoid duplicate addresses.

   Alternatively, you can set the instrument for dynamic IP addressing using DHCP. In a long distance network, however, it may be difficult or impossible to determine what the current dynamic address is, after the instrument is in the field.

5. Set instrument parameters as appropriate, such as measurement mode, frequency range, amplitude. You may skip this step and set up the instrument remotely at a later time, after Ethernet connection has been established.

6. Launch a Web browser on your PC, laptop, or mobile device.

7. Enter the instrument IP address in the browser search bar and click the Search arrow.

Depending on user login status and whether a password is required, either the Web Remote Control login page or the Home page will display. See Figure 9-2 on page 9-4 and Figure 9-3 on page 9-5.

Connection to a Wi-Fi Portable Router

Instead of connecting the instrument directly to a LAN, you can connect it to a Wi-Fi router. This section documents connection to the ZyXEL MWR102 Portable Router as an example.

1. Take note of the router's SSID and pre-programmed password, which are found on a sticker affixed to the router.

2. Using the Ethernet cable included with the router, connect one end to the black LAN port and the other end to the test instrument's Ethernet port.

3. Insert the Mini-B (small) end of the provided USB cable into the router and the Type-A (larger) end of the cable into one of the USB ports of your test instrument.

4. Optionally, secure the router to the instrument body using a strip of Velcro or other hook-and-loop fastener. You may also place the router in the instrument carrying case, if it fits.

5. Use your computer's Wi-Fi Network Connection utility to find the router. With the ZyXEL MWR102 Portable Router, the SSID name will be ZyXEL followed by an alphanumeric string unique to your particular router.

6. Connect to this SSID. When prompted, enter the router password noted in Step 1.

7. Set the IP address manually on the Spectrum Master. Refer to "Ethernet Menu" on page D-2 and see Figure 9-1.

8. Enter the instrument IP address in the browser search bar and click the Search arrow.

Depending on user login status and whether a password is required, either the Web Remote Control login page or the Home page will display. See Figure 9-2 on page 9-4 and Figure 9-3 on page 9-5.
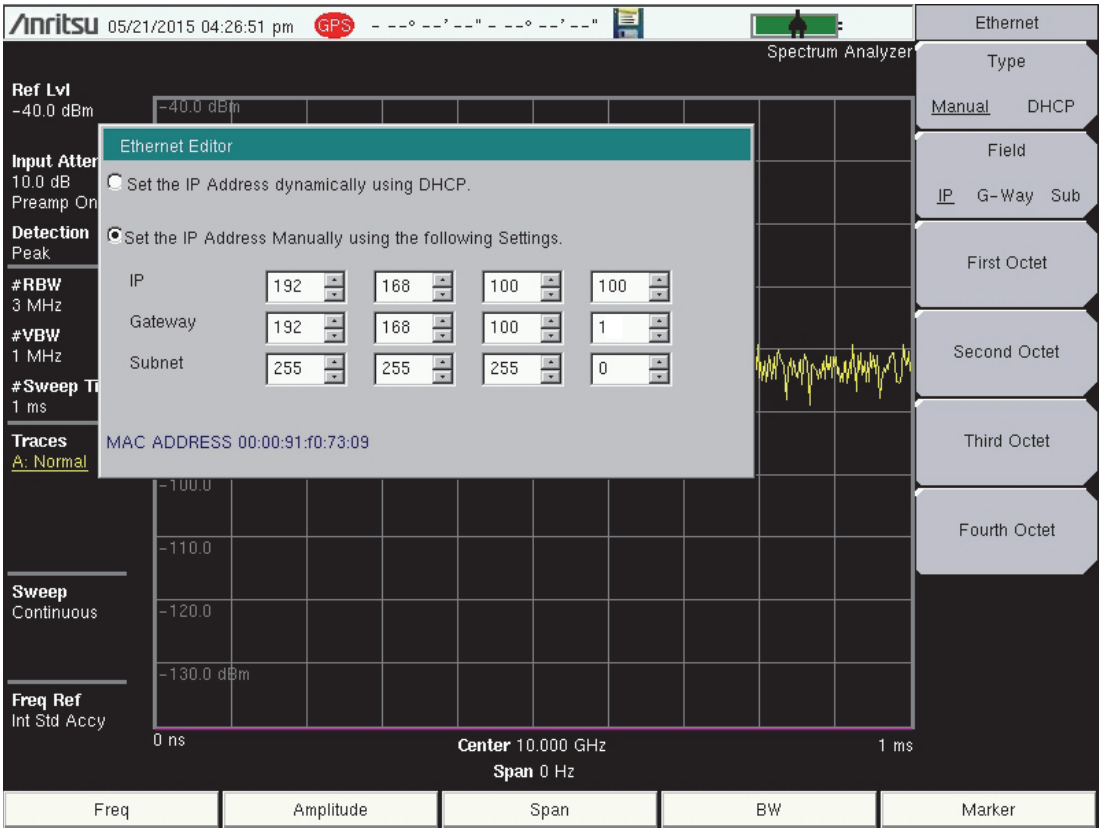
Figure 9-1.   Setting IP Address Manually

9-3   Web Remote Control Interface

After you have entered the instrument IP address in a Web browser's address bar, the Web Remote Control login page opens if this is the first time you are connecting to the instrument, or if a password is required and you previously logged out. Enter the instrument password or leave the field blank if no password has been set, then click Login. See Figure 9-2.

Figure 9-2.   Login Page

Only one user at a time can connect to the instrument. If you attempt to connect after another user, a message is displayed on the login page, indicating the instrument is currently being used by another client. If you try again after one minute, the current user's session will be terminated and you will then have control of the instrument.

Notes	• There may be a period of a few minutes from the time a user logs out until the instrument is released. During this time, connection attempts by other users will fail.
	• Closing the Web Remote Control browser window without logging out also releases the instrument after a period of a few minutes.
	• If you have previously connected to this instrument, the login page is skipped and the Web Remote Control Home page opens, provided no other user is currently connected to the same instrument.

Upon successful connection, the Web Remote Control Home page displays on your PC or mobile device, as illustrated in Figure 9-3 on page 9-5. Information displayed on the Home page is the same as the System Status window on the instrument.

At the top of the browser window, a green title bar shows the instrument model number and IP address. If the instrument has been assigned a name, this name is displayed in the center of the title bar. The menu bar consists of tabs for commands and links.

Figure 9-3.   Web Remote Control Home Page

Menu Bar

Remote Control

Opens "Remote Control" on page 9-7.

Capture Screen

Captures a JPEG image of the instrument display and saves it directly to internal memory. A file name is automatically created using the current date and time stamp. Only the instrument display will be pictured on the Web page under the menu bar. See Figure 9-4. In Windows, you can right-click on the screen and select Copy. With iOS, press and hold on the picture. This makes it easy to create documentation using screen captures.
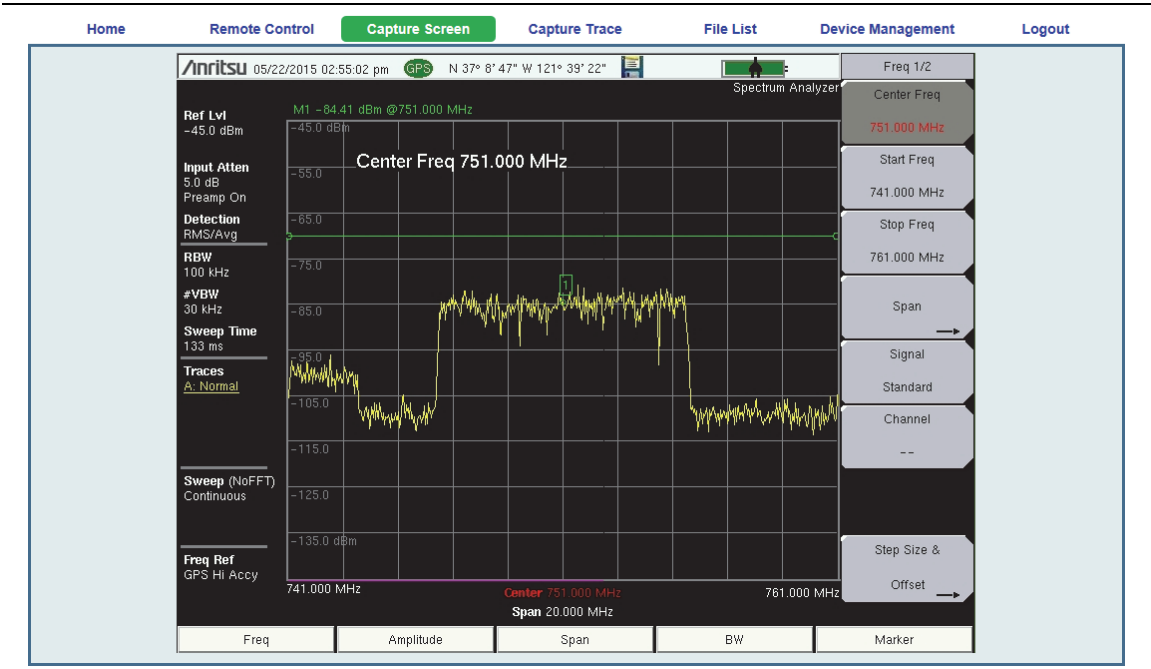
Figure 9-4.   Capture Screen Page

Capture Trace

Opens an input dialog to enter a name for the trace to be saved. See Figure 9-5. After clicking Save, a confirmation dialog opens to indicate the trace was successfully saved to the instrument.
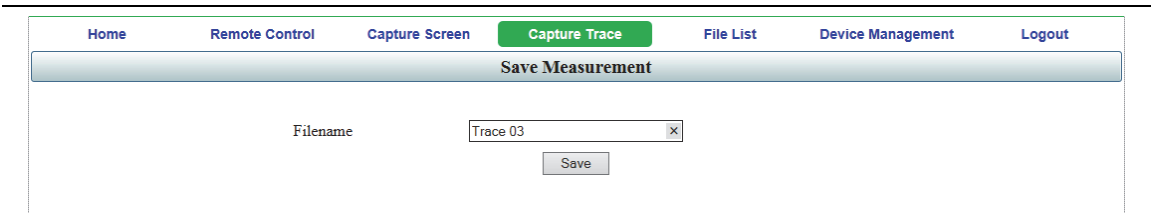
Figure 9-5.   Capture Trace Page

Depending on the browser and operating system used, different prompts may appear. Some operating systems like iOS may not support file saving from a browser.

File List

Displays the list of folders and files contained in the instrument's internal memory. You can select from the list the files or folders you wish to download to your PC or mobile device. Refer to "File List" on page 9-9.

Device Management

Opens "Device Management" on page 9-9, where you can set the instrument password and assign a name to the instrument.

Logout

Exits Web Remote Control and displays the login page. To return to Web Remote Control, enter the password or leave the field blank if no password has been set, then click Login. See Figure 9-2 on page 9-4.

Remote Control

The Remote Control instrument display shows a bitmap image of the instrument screen. The buttons on the right of the display reflect the layout of the buttons on the instrument and are used to access the same monitoring and control functions. See Figure 9-6.
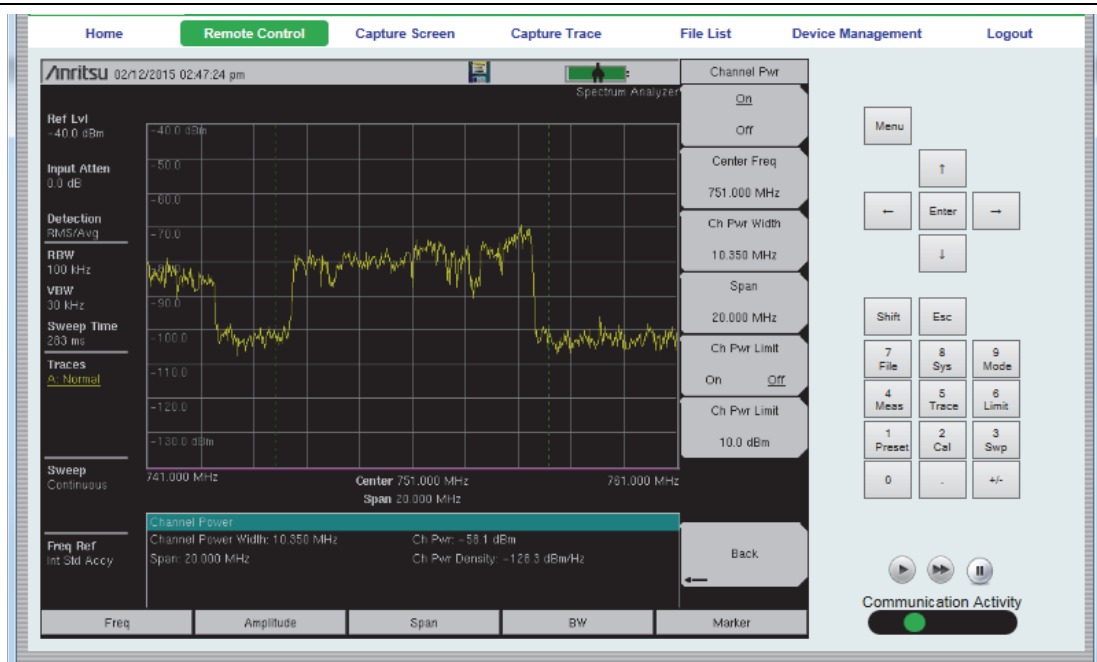
Figure 9-6.   Remote Control Page

Normal Mode

Normal Mode is the default mode, where the bitmap image of the instrument screen is continually refreshed in the browser window. Click the single arrow button at the bottom right of the screen or any tab on the menu bar to return to Normal Mode from either Fast or Pause Mode.

Fast Mode

Click the double arrow button to enter Fast Mode, where the update rate can be significantly faster than Normal mode, especially over low bit-rate connections. Only the measurement data (yellow trace) is continually updated. The main menu keys and submenu keys may look different than in Normal Mode, but their functions are the same. Error messages are not shown in Fast Mode.

Fast Mode is not available with some Spectrum Analyzer measurement types, in which case the Fast Mode button is disabled. The button is not displayed when the measurement mode is something other than Spectrum Analyzer.

While in Fast mode, if a measurement type is selected that Fast mode does not support, the instrument will return to Normal mode.

Pause Mode

Clicking the Pause button turns the Communication Activity dot in the lower right-hand corner to yellow. If the interface was in Normal Mode, this stops the instrument display from refreshing in the browser window. If the interface was in Fast Mode, the trace measurement stops updating. Click the single arrow or the double arrow button to resume remote communications with the instrument in Normal or Fast Mode, respectively. The Communication Activity dot then returns to green.

Communication Activity

The moving dot labeled Communication Activity, when green, indicates that ongoing communication is occurring between the instrument and PC. When you click Home, Capture Screen, Capture Trace, File List, Device Management, or Logout on the menu bar, the Communication Activity dot briefly turns yellow before the selected page opens in the browser.

Notes	• When clicking a main menu key, submenu key, or measurement icon on the screen display, a small green dot appears at the point of the cursor to indicate that the key, button, or icon was pressed.
	• A single Web-enabled device can monitor and control multiple instruments. However, multiple Web-enabled devices with different IP addresses cannot connect to the same instrument simultaneously.

File List

Displays the list of folders (type "dir") and files contained in the instrument's internal memory. See Figure 9-7. To view the contents of a folder, click on the folder name.
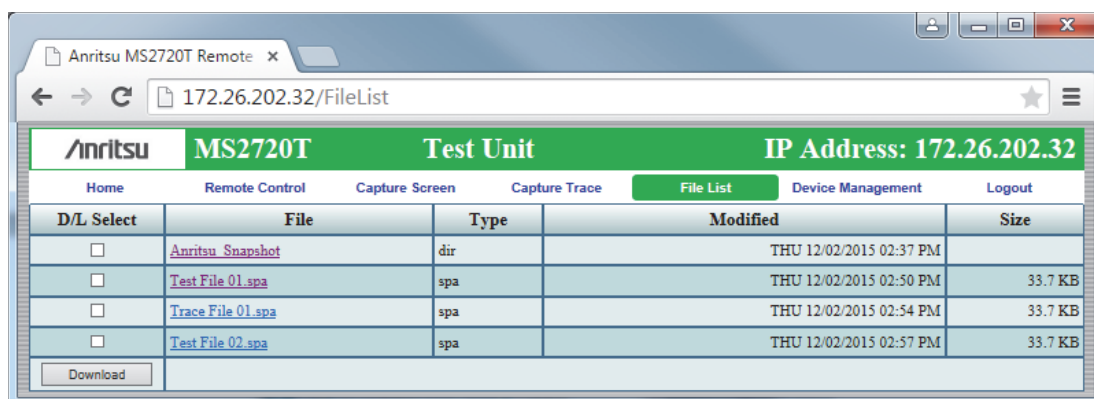
Figure 9-7.   File List Page

To download a file, click the file name. Alternatively, you can select the checkbox on the left of the file name, then click Download. You may also select the checkboxes of multiple files and/or folders and download them together, as a zipped folder. In this case, a pop-up dialog box shows the estimated download time. Press OK to continue.

Note	Some operating systems may not support file downloads. iOS is an example.

Depending on the browser and operating system, the download function may allow you to open the file or save it, or both. In Google Chrome, for example, the downloaded file or files are automatically saved to the designated folder on your computer, such as the Downloads folder. In the banner at the bottom of the browser window, click a downloaded item to open it.

If the selected item is a single file, the file will open in the default application for the file type. For example, a JPEG file will open in the computer's default image viewer, while a measurement file will open in Master Software Tools (MST), provided the application is installed.

Device Management

Click the Device Management tab on the menu bar to set or clear the instrument password, or to assign a device or unit name to the instrument. See Figure 9-8 on page 9-10.

Password

If no password is set, access to the instrument is unrestricted and any user who knows the instrument IP address can connect to it, provided the instrument is not being used. When a password is set, the user is prompted for the password upon login.

The login page is skipped and the user is directed straight to the Web Remote Control Home page if he or she was previously connected to the instrument, then closed the browser without logging out, and no other user has logged in to the same instrument since that time.

Instrument Name

The instrument name is displayed in the green title bar of the browser screen. It is useful in identifying the instrument when you have more than one instrument connected. The name can be assigned remotely from this Device Management page, or it can be set from the instrument's System Options menu. Note that this instrument name is not a "hostname" as used in an Ethernet router.

Figure 9-8.   Device Management Page

Logout

Exits Web Remote Control and displays the login page. To return to Web Remote Control, enter the password or leave the field blank if no password has been set, then click Login.

Appendix A — Related Documents

A-1 Introduction

This appendix provides a list of supplemental documentation for Spectrum Master features and options. These measurement guides are available as PDF files on the Document Disc and as free downloads from the Anritsu Web site. To determine the spectrum analyzer firmware version in your instrument, refer to submenu key description for "Status" on page 5-4.

Options

Table A-1. Analyzers and Analyzer Options

Spectrum Master Feature (Required Option)	Related Document (Part Number)
All Spectrum Master Instruments	Important Product Information, Compliance and Safety Notices (10100-00065)
Spectrum Analyzer (709, 713, 720, 732, or 743) IQ Waveform Capture (24) Interference Analyzer (25) Channel Scanner (27) Zero-Span IF Output (89) Gated Sweep (90) Coverage Mapping (431) EMF Measurements (444) AM/FM/PM Analyzer (509)	Spectrum Analyzer Measurement Guide (10580-00349)
Tracking Generator (809, 813, or 820)	Tracking Generators Measurement Guide (10580-00339)
High-Accuracy Power Meter (19)	Power Meter Measurement Guide (10580-00240)
IEEE 802.16 WiMAX Fixed and Mobile Signal Analyzer (885)	WiMAX Signal Analyzer Measurement Guide (10580-00236)
CDMA2000 1X and EV-DO Signal Analyzer (884)	3GPP2 Signal Analyzer Measurement Guide (10580-00235)
GSM/GPRS/EDGE Signal Analyzer (880) W-CDMA/HSPA+ Signal Analyzer (881) TD-SCDMA/HSPA+ Signal Analyzer (882) LTE/LTE-A (FDD and TDD) Signal Analyzer (883)	3GPP Signal Analyzer Measurement Guide (10580-00234)

Related Documents

Table A-2.   Related Documents

Document Description	Part Number
Performance Specifications Spectrum Master Technical Data Sheet	11410-00646
Product Brochure	11410-00647
Programming Manual	10580-00341
Maintenance Manual	10580-00342
PIM Analyzer (requires PIM Master MW82xxA)	10580-00280
Handheld Instruments Document Disc	10920-00060

A complete suite of computer software applications are available for download:

http://www.anritsu.com/en-US/Services-Support/Handheld-Tools-Tool-Box.aspx

Appendix B — Secure-Environment Workplace

B-1   Introduction

This section describes Option 7 (Secure Data Storage) and Frequency Blanking, types of memory in the Spectrum Master, how to delete stored user files in internal memory, and recommended usage in a secure-environment workplace.

Option 7, Secure Data Storage

Option 7, Secure Data Storage, sets the instrument to allow saving information **only** to an external USB flash drive. Saving to the internal memory is disabled. When Option 7 is installed, it is effective immediately and cannot be turned off. In order to turn off Secure Data Storage, the option must be removed from the instrument by a service center.

Caution	Note that even with Option 7 enabled, operating parameters (such as frequency range and power level that are set by the user) remain stored in the Spectrum Master EEPROM when the Spectrum Master is turned OFF. These parameters can be erased, however, via a Master Reset operation, as described in section "Erase All User Files in Internal Memory" on page B-3.

Frequency Blanking

Option 7 allows you to hide the displayed frequency values. Frequency values displayed on the screen and menus are replaced with ##.####. To enable frequency blanking press the **Shift** key, then the **System** (**8**) key. Press the System Options submenu key, then the Reset submenu key. Press the Frequency Blanking submenu key so that <u>On</u> is underlined. Setting Frequency Blanking back to <u>Off</u> will preset the instrument to factory default settings.

After frequency blanking is enabled the instrument user is **not able** to restore the frequency readouts. Following is a list of the security measures that have been taken to protect the frequency information after Frequency Blanking is turned on.

1. Turning off frequency blanking presets the instrument (and the frequencies) to the factory default settings.

2. Turning off the instrument presets the instrument to the factory default settings and turns off frequency blanking.

3. Presetting the instrument turns off frequency blanking and restores the factory default settings.

4. Option 7 is designed to ensure that user files and calibration files cannot be stored in the internal memory of the instrument.

Warning	Note that when Frequency Blanking is turned on, user files can still be stored and saved to an external USB drive, and that frequency information is not blanked in those files. Also, frequency information is not blanked from the SCPI commands that are used to remotely control the instrument.

Remote Access Password

The purpose of the password is to protect the Spectrum Master from unauthorized access. Connecting to the instrument via Master Software Tools (v2.21.1 or later), Wireless Remote Tools (WRT), or the Web Remote Control browser interface will require the set password.

Spectrum Master Memory Types

The instrument contains non-volatile (SSD) memory, EEPROM, and volatile DRAM memory. The instrument does not have an internal hard disk drive or any other internal type of volatile or non-volatile memory.

On the top connector panel, the Type A USB connector may be used to connect a flash drive. The 5-pin mini-B USB connector may be used to connect to a PC for data transfer.

Non-Volatile Memory

This solid-state drive (SSD) memory stores user-defined data, such as traces and setups.

EEPROM

This memory stores the model number, serial number, and calibration data for the instrument. Also stored here are the user-set operating parameters, such as frequency range. During the master reset process, all operating parameters that are stored in the EEPROM are set to standard factory default values.

RAM Memory

This is volatile memory that is used to store parameters that are needed for the normal operation of the instrument along with current measurements. This memory is reset whenever the instrument is restarted.

External USB Flash Drive (not included with the instrument)

This memory may be selected as the destination for saved measurements and setups for the instrument. You can also copy the contents of the internal non-volatile memory to the external flash memory for storage or data transfer. The external Flash USB can be reformatted or sanitized using software on a PC.

Refer to the Chapter 4, "File Management" for additional information about saving and copying files to the USB flash drive.

Erase All User Files in Internal Memory

Perform a **Master Reset**:

1. Turn **On** the instrument.

2. Press the **Shift** button then the **System** (**8**) key.

3. Press the System Options submenu key.

4. Press the Reset key, then the Master Reset key.

5. A dialog box is displayed on the screen to warn that all settings will be returned to factory default values, and that all user files will be deleted.

Warning	With regard to data security, this deletion is a standard file delete and does not involve overwriting existing information.

6. Press the **Enter** button to complete the master reset.

7. The instrument reboots, and the reset is complete.

Note	A Master Reset can be made by turning **On** the Spectrum Master while depressing the **System** (**8**) key. Hold these keys until the splash screen is displayed. This is also described as **System+ON**. A Factory Default Reset can be made by turning **On** the Spectrum Master while depressing the **Esc** key. Hold these keys until the splash screen is displayed. This is also described as **ESC+ON**.

Recommended Usage in a Secure Environment

The Spectrum Master does not currently provide a secure erase feature. In environments where data security is an issue, Anritsu Company recommends that you store your Spectrum Master-created files on an external USB Flash drive that is then securely retained, sanitized, or destroyed after use.

To set the Spectrum Master to save files to an external USB Flash drive:

1. Attach the external Flash drive and turn on the instrument.

2. Press the **Shift** button then the **File** (**7**) key.

3. Press the Save submenu key.

4. Press the Change Save Location submenu key and (using the arrow keys or rotary knob) select the location on the USB drive where the files are to be saved.

5. Press the Set Location submenu key.

6. Press **Esc** to clear the Save dialog box.

The external USB drive location has been set as the default location for saving files.

Note	Not all USB drives are compatible with the instrument. Many drives come with a second partition that contains proprietary firmware. This partition must be removed. Only one partition is allowed. Refer to the individual manufacturer for instructions on how to remove it. Some drives can be made to work by reformatting them using the FAT32 format.

Appendix C — Error Messages

C-1   Introduction

This chapter provides a list of information and error messages that could be displayed on the MS2720T Spectrum Master. If any error condition persists, contact your local Anritsu Service Center (http://www.anritsu.com/contact-us).

C-2   Self Test or Application Self Test Error Messages

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.

Lock Test FAILED

One or more Phase Lock Loops Failed to properly achieve Lock Status. Ensure that the battery level is adequate for operation or that temperature is within acceptable limits. Reset to factory defaults with either Factory Reset (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 (MS2720T-0709)

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. 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

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. If the error persists, contact your Anritsu Service Center.

C-3   Operation Error Messages

Fatal Error

Usually caused by a failure to communicate with one section or another. Sometimes resolved by restarting the unit or by Factory Reset (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 an 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.

Unable to add additional limit points. 41 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.

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 1 V_{p-p}.

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 in the same manner as the Log display mode.

Cannot turn on delta marker because Ref Marker is a counter Marker

Delta markers cannot be enabled unless the primary marker is NOT a counter Marker. Turn off the Counter Marker mode of marker operation to use Delta Marker.

Triggering only available 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 such as RBW/VBW, averaging, and so forth, 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 Number of Averages on a recalled trace. The trace is displayed with the same parameters in which it was saved.

Reference LVL Cal is OFF

Factory Calibration is OFF. Ensure that the battery level is adequate for operation or that the temperature is within acceptable limits. Reset to factory defaults with either Factory Reset (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. Ensure that the battery level is adequate for operation or that the temperature is within acceptable limits. Reset to factory defaults with either Factory Reset (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.

Fan Failure

The system has determined that the fan should be running due to the internal temperature of the unit, but cannot detect that the fan is actually running.

It is important to keep the fan inlet and exhaust ports clear of obstructions. The cooling fan will vary the speed in relation to the internal temperature of the instrument. The fan will turn on at low speed when the internal temperature of the instrument reaches 44 °C, and will increase the fan speed to maximum at 54 °C. As the internal temperature of the instrument decreases, the fan will reduce speed until the temperature reaches 39 °C, at which point the fan will turn off.
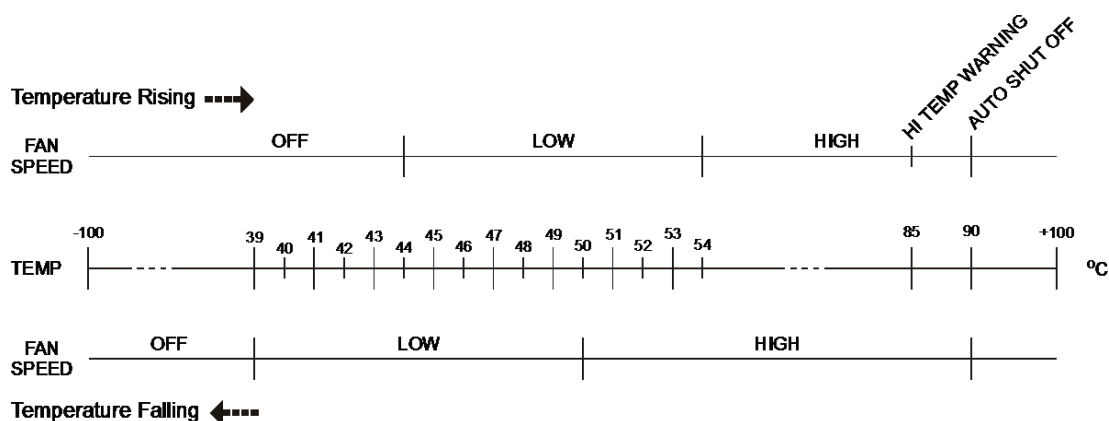
Figure C-1.   Fan Speed versus Temperature

High Temp Warning

The internal temperature has reached an excessive level, 85°C. 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 if the internal temperature reaches 90°C, then 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, then reset to the factory defaults with either Factory Reset (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 USB Memory

Attempt to copy user saved data to the external USB Flash drive has failed. Do not attempt to remove or power down the unit before the copy has completed. Be sure that the USB memory device is not already full and that it is fully inserted into the USB connector.

PLL Lock Fail

Phase Lock Loop failed to lock.

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.

Appendix D — LAN and DHCP

D-1 Introduction

This appendix describes network connections for the MS2720T Spectrum Master.

D-2 LAN Connection

The RJ-45 connector is used to connect the Spectrum Master to a local area network. Integrated into this connector are two LEDs. The amber LED shows the presence of a 10 Mbit/s LAN connection when on, and a 100 Mbit/s LAN connection when off. The green LED flashes to show that LAN traffic is present.

Note	The instrument periodically checks for a connection to the LAN and will enable the Ehernet port automatically when connected.

D-3 Ethernet Configuration

The instrument IP address is set by pressing the **Shift** key, then the **System** (**8**) key followed by the System Options submenu key and the Ethernet Config submenu key. The instrument Ethernet address can be set automatically using DHCP, or manually by entering the static 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 a common method of configuring a device for network use.

Ethernet Menu

Key Sequence: **Shift**, **System** (**8**) > **System Options >** Ethernet Config

	Type
Ethernet	**Manual DHCP:** Press the Type submenu key to select whether the IP address will be entered manually or will be supplied automatically by a network DHCP server. See Figure D-2 and Figure D-3 on page D-3. If Manual is selected, use the submenu keys or the **Left/Right** arrow keys to select the field that is to be modified in the Ethernet Editor dialog. Use the numeric keypad, the **Up/Down** arrow keys, or the rotary knob to enter the values. Press **Enter** to accept the changes, or press the **Esc** key to exit Ethernet Configuration without making changes.
Type	
Manual DHCP	
Field	**Field**
IP G-Way Sub	**IP G-Way Sub:** Press this submenu key to select the desired Internet Protocol Property to be edited.
First Octet	**First Octet:** Moves the cursor to the leftmost column of the selected IP properties field.
Second Octet	**Second Octet:** Moves the cursor to the second column from the left of the selected IP properties field.
Third Octet	**Third Octet:** Moves the cursor to the third column from the left of the selected IP properties field.
Fourth Octet	**Fourth Octet:** Moves the cursor to the fourth column from the left of the selected IP properties field.

Figure D-1.   Ethernet Menu
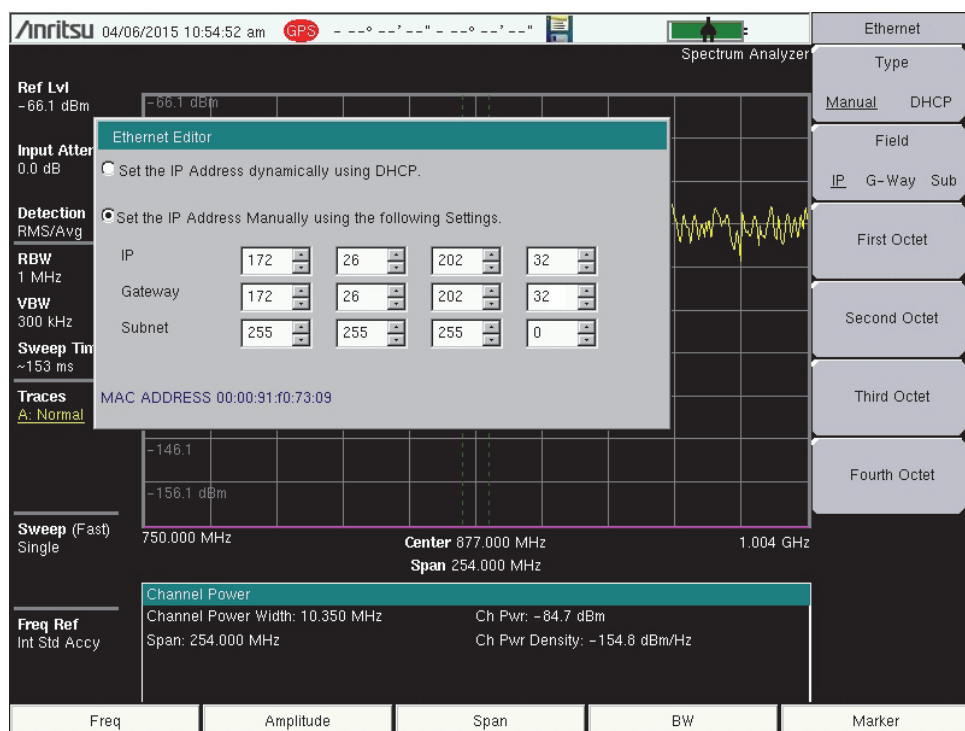
Figure D-2.   Setting IP Address Manually
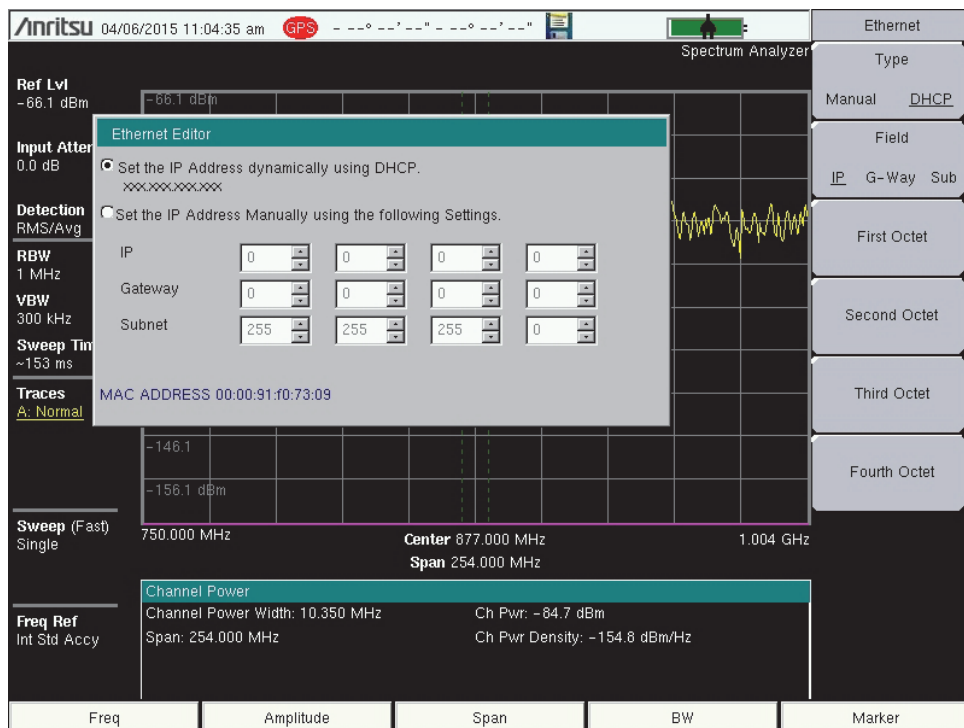
Figure D-3.   IP Address Assigned Using DHCP

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 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 that requests an IP address. Normally, some amount of lag time is present on the DHCP server end, so if the device is connected again reasonably soon, then it may end up with the same address.

When a DHCP server is not available, a static IP address can be used. A static IP address is a fixed address. After being 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 the 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. Static IP addresses are necessary when you have no physical access to the instrument, or any other way to determine the instrument's IP address assigned by the DHCP server.

Default Gateway

Often when a static IP address is assigned, a default gateway is also identified. If the default gateway is unknown, then 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 no network DHCP service is 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
```

D-4   ipconfig Tool

A few tools that are built into the Microsoft Windows operating system can assist in making some determinations about the network to which the PC is connected. Typing ipconfig at a command prompt produces a display of information about the in-use parameters of the PC and its network connection. Following is an example of the typical results expected:

Note	The ipconfig display does not report whether the information is from a DHCP server or from 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
```

D-5   Ping Tool

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) to receive a reply. Basically, the ping function sends out a request to a specific address to determine if a computing device is connected to the network at that address. If a valid connection is found, then a copy of the signal (that was sent) is returned. If a connection is not found, then the response is "request timed out", which means that no reply was received 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 milliseconds:

Minimum = 0 ms, Maximum = 0 ms, Average = 0 ms
```

Appendix E — Glossary of Terms

E-1   Introduction

The following terms are related to this product and technology.

E-2   Glossary of Terms

Adapter : A fitting that supplies a passage between two sets of equipment when they cannot be directly interconnected.

Adaptive Array
Antenna : Adaptive array antenna is a type of advanced 'smart' antenna technology that continually monitors a received signal and dynamically adapts signal patterns to optimize wireless system performance. The arrays use signal processing algorithms to adapt to user movement, to changes in the radio-frequency environment, and to multi-path and co-channel interference.

ADC : Analog-to-Digital Converter (ADC, A/D or A to D) is an electronic device that converts continuous signals to discrete digital numbers. The reverse operation is performed by a digital-to-analog converter (DAC). ADC can uniquely represent all analog input values within a specified total input range by a limited number of digital output codes. Refer also to DAC.

Analog System : An Analog system uses an analog transmission method to send voice, video and data-using analog signals, such as electricity or sound waves, that are continuously variable rather than discreet units as in digital transmissions. Mobile analog systems include AMPS, NMT and ETACS.

Analog
Transmission : Analog Transmission refers to signals propagated through the medium as continuously varying electromagnetic waves.

Antenna Gain : Antenna gain, also known as antenna directivity, is the relative gain of the main beam of an antenna pattern to a reference antenna, usually an isotropic or standard dipole. Antenna Gain is the effectiveness of a directional antenna expressed as the ratio of input power of the directional antenna to input power of an isotropic radiator to provide the same field strength in the desired direction. Sometimes related to a dipole antenna.

Attenuation : Attenuation refers to decreasing in signal magnitude between two points. These points may be along a radio path, transmission line or other devices.

Attenuator : Attenuator is a device specifically designed to decrease the magnitude of a signal transmitted through it.

Average power : Average power is the peak power averaged over time and is usually applied to pulsed systems where the carrier power is switched on and off.

Backhaul : In wireless technology, backhaul refers to transporting voice and data traffic from a cell site to the switch.

Band Pass Filter : A Band Pass Filter is a radio wave filter with a specific range of frequencies in which it is designed to pass. It rejects frequencies outside the pass-band range. A resistor-inductor-capacitor circuit is an example of a Band Pass Filter.

Bandwidth : Bandwidth usually identifies the capacity of a circuit or amount of data that can be sent through a given circuit. It may be user-specified in a PVC. It is an indication of the amount of data that is passing over a medium. Also, bandwidth is the portion of the frequency spectrum required to transmit desired information. Each radio channel has a center frequency and additional frequencies above and below this carrier frequency which is used to carry the transmitted information. The range of frequencies from the lowest to the highest used is called the bandwidth.

BER : Bit Error Rate or Bit Error Ratio (link quality specification/testing) (BER) is a measure of transmission quality. The ratio of error bits to the total number of bits transmitted. A bit error rate of 10-6 refers to an average of one error per million bits. It is generally shown as a negative exponent, (for example, 10-7 which means 1 out of 107 bits are in error or 1 out of 10,000,000 bits are in error). Bit Error Rate is the fraction of a sequence of message bits that are in error.

BERT : Bit Error Rate Test/Tester (BERT) is a test that gauges the quality of the T1 or digital line. By sending a known pattern to another device across the span, the far end device can compare incoming pattern to its own, thereby indicating bit errors on the line.

Broadband : Broadband refers to telecommunication that provides multiple channels of data over a single communications medium, typically using some form of frequency or wave division multiplexing. It is a service or system requiring transmission channels capable of supporting rates greater than the Integrated Services Digital Network (ISDN) primary rate.

Coaxial Cable : Coaxial Cable (Coax) is a type of electrical communications medium used in the LAN environment. This cable consists of an outer conductor concentric to an inner conductor, separated from each other by insulating material, and covered by some protective outer material. This medium offers large bandwidth, supporting high data rates with high immunity to electrical interference and a low incidence of errors. Coax is subject to distance limitations and is relatively expensive and difficult to install.

CW : Continuous Wave (CW)

DANL : Displayed Average Noise Level (DANL): Displayed average noise level is sometimes confused with the term Sensitivity. While related, these terms have different meanings. Sensitivity is a measure of the minimum signal level that yields a defined signal-to-noise ratio (SNR) or bit error rate (BER). It is a common metric of radio receiver performance. Spectrum analyzer specifications are always given in terms of the DANL. One of the primary uses of a spectrum analyzer is to search out and measure low-level signals. The limitation in these measurements is the noise generated within the spectrum analyzer itself. This noise, generated by the random electron motion in various circuit elements, is amplified by multiple gain stages in the analyzer and appears on the display as a noise signal. On a spectrum analyzer, this noise is commonly referred to as the Displayed Average Noise Level, or DANL 1. While there are techniques to measure signals slightly below the DANL, this noise power ultimately limits our ability to make measurements of low-level signals.

DAS : Distributed Antenna System (DAS) is a network of antenna nodes that are used to provide wireless service in a limited area or in a building. A DAS may be indoors or outdoors. Such an antenna or series of antennas can be connected via coaxial cable, leaky feeder, or optical fiber link.

dB : Decibel or deciBel (dB) is a unit for measuring relative power ratios in terms of gain or loss. The units of dB are expressed in terms of the logarithm to base 10 of a ratio and typically are expressed in watts. For example, a -3dB loss indicates a 50% loss in power; a +3dB reading is a doubling of power; 10 dB indicates an increase (or a loss) by a factor of 10; 20 dB indicates an increase (or a loss) of a factor of 100; 30 dB indicates an increase (or a loss) by a factor of 1000.

dBc : Decibels referenced to the carrier (dBc) is a technique for expressing a power measurement in logarithmic form using the carrier power as a reference. The units are used to describe how far down signals and noise are relative to a known signal. Typical use of this term is to describe spurious signals and noise compared to a desired transmit signal.

dBm : dBm is a decibel value referenced to a milliWatt (dBm). This is a technique for expressing a power measurement in logarithmic form using 1 mW as a reference. dBm is a decibel ratio (log 10) of Watts (W) to one milliwatt (1mW). dBm, therefore, represents absolute power.

DHCP : Dynamic Host Configuration Protocol (DHCP)

DSP : Digital Signal Processing (DSP)

EMI : ElectroMagnetic Interface (EMI): EMI refers to signals that are generated and radiated by an electronic device and that cause interference with radio communications, among other effects. MI is the interference by electromagnetic signals that can cause reduced data integrity and increased error rates on transmission channels.

Flash Memory : Flash memory is a non-volatile solid state storage device that is packaged as a chip. It can be electrically erased and reprogrammed. T is primarily used in memory cards, USB flash drives, MP3 players, and solid-state drives for general storage and transfer of data between computers and other digital products. Is a specific type of EEPROM (electrically erasable programmable read-only memory) that is erased and programmed in large blocks.

Gain : Gain refers to the ratio of the output amplitude of a signal to the input amplitude of the signal. This ratio typically is expressed in dB. He higher the gain, the better the antenna receives or transmits, but also the more noise it includes.

GPS : The Global Positioning System (GPS) is a space-based global navigation
satellite system (GNSS) that provides reliable location and time
information in all weather and at all times when and where an
unobstructed line of sight is available to four or more GPS satellites.
The system is maintained by the United States government and is
freely accessible by anyone with a GPS receiver. The Global Positioning
System is making it possible for people using ground receivers to
determine their geographic location within 10 to 100 meters. The
satellites use simple mathematical calculations to broadcast
information that is translated as longitude, latitude, and altitude by
Earth-based receivers.

NF : Noise Figure (NF) is a measure of degradation of the signal-to-noise
ratio (SNR) that is caused by components in a radio frequency (RF)
device. The noise factor (F) of a system is defined as the signal-to-noise
ratio of the input power of the system divided by the signal-to-noise
ratio of the output power of that system. F (the noise figure) is defined
as the decibel value of the noise factor. = 10log (F) where log uses the
base 10, or common log. T s formula is valid only then the input
termination is at standard noise temperature.

OBW : Occupied Bandwidth (OBW) is a measure of the bandwidth containing
99% of the total integrated power of the transmitted spectrum, centered
on the assigned channel frequency. Interference to other channels or to
other systems can occur if OBW is too large.

OTA : Over The Air (OTA): OTA refers generally to any transfer of information
or signal that takes place in a wireless environment, rather than using
a wired connection. OTA is usually used in connection with a standard
defining the provisioning of mobile devices and applications, such as
downloading or uploading content or software, and commonly used in
conjunction with the Short Messaging Service (SMS). SMS OTA
Messages contain information that is used to configure the settings of a
WAP browser in a mobile phone (refer to SMS and WAP).

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