

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 www.anritsu.com.

The Anritsu logo consists of the word "Anritsu" in a bold, sans-serif font. The letter "A" is stylized with a diagonal slash through it. The logo is positioned in the bottom right corner of the page.

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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 PIM Hunting Spectrum Analyzer (Option 709, 713, 720, 732, or 743) IQ Waveform Capture (Option 24) Interference Analyzer (Option 25) Channel Scanner (Option 27) Zero-Span IF Output (Option 89) Gated Sweep (Option 90) Coverage Mapping (Option 431) EMF Measurements (Option 444) AM/FM/PM Analyzer (Option 509)
10580-00234	3GPP Signal Analyzer Measurement Guide GSM/GPRS/EDGE Measurements (Option 880) W-CDMA/HSPA+ Measurements (Option 881) TD-SCDMA/HSPA+ Measurements (Option 882) LTE/LTE-A FDD/TDD Measurements (Option 883) LTE 256 QAM Demodulation Measurement (Option 886) NB-IoT Measurements (Option 887)
10580-00235	3GPP2 Signal Analyzer Measurement Guide CDMA/EV-DO Measurements (Option 884)
10580-00236	WiMAX Signal Analyzer Measurement Guide WiMAX Fixed/Mobile Measurements (Option 885)
10580-00240	Power Meter Measurement Guide High Accuracy Power Meter (Option 19)
10580-00339	Tracking Generator Measurement Guide Tracking Generator (Option 809, 813, or 820)
10580-00341	SCPI Programming Manual
10580-00455	EMF Measurement Guide (Option 444)
11410-00646	Spectrum Master MS2720T Technical Data Sheet

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 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. The instrument is designed for monitoring, measuring, and analyzing signal environments. Measurements can easily be 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.

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.

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 simultaneously charges the battery.

The combination of a touch screen and keypad enables users to navigate menus with the touch screen and enter numbers with the keypad.

Time and date stamping of measurement data is automatic. The internal memory provides for the storage and recall of up to 1000 measurement setups and up to 1000 traces. Measurements and setups can be stored in a USB flash drive or transferred to a PC by using the included USB cable.

Note

Not all after-market USB drives are compatible with the Spectrum Master. 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. You may also try reformatting a drive that contains a single partition using FAT32 format.

Available Models

Table 1-1 lists the frequency options available with the Spectrum Master MS2720T.

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-0007	Secure Data Operation
MS2720T-0009	I/Q Demodulation Hardware
MS2720T-0019	High Accuracy Power Meter (requires USB Power Sensor)
MS2720T-0024	I/Q Waveform Capture (requires Option 9)
MS2720T-0025	Interference Analyzer (Option 31 recommended)
MS2720T-0027	Channel Scanner
MS2720T-0031	GPS Receiver (requires GPS Antenna)
MS2720T-0089	Zero-Span IF Output
MS2720T-0090	Gated Sweep
MS2720T-0431	Coverage Mapping (requires Option 31 for full functionality)
MS2720T-0444	EMF Measurements (requires Anritsu Isotropic Antenna)
MS2720T-0509	AM/FM/PM Measurements (requires Option 431 for full functionality)
MS2720T-0880	GSM/GPRS/EDGE Measurements (requires Option 9)
MS2720T-0881	W-CDMA/HSPA+ Measurements (requires Option 9, Option 31 recommended)
MS2720T-0882	TD-SCDMA/HSPA+ Measurements (requires Option 9, Option 31 required for full functionality)
MS2720T-0883	LTE/LTE-A FDD/TDD Measurements (requires Option 9, Option 31 required for full functionality)
MS2720T-0886	LTE 256 QAM Demodulation Measurements (requires Option 883)
MS2720T-0887	NB-IoT Measurements (requires Option 9)
MS2720T-0884	CDMA/EV-DO Measurements (requires Option 9, Option 31 required for full functionality)
MS2720T-0885	WiMAX Fixed/Mobile Measurements (requires Option 9, Option 31 required for full functionality)
MS2720T-0098	Standard Calibration to ISO17025 and ANSI/NC SL Z540-1. Includes calibration certificate.
MS2720T-0099	Premium Calibration to ISO17025 and ANSI/NC SL Z540-1. Includes calibration certificate, test report, and uncertainty data.

1-3 Calibration and Verification

Anritsu recommends annual calibration and performance verification 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

Instrument care and preventive maintenance consist of cleaning the unit and inspecting and cleaning the RF connectors and all accessories. Clean the instrument 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 Spectrum 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 instrument without discharging the static charge) may damage the Spectrum Master input circuitry. Instrument 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 Spectrum Master, it is recommended that any static charges that may be present be dissipated before connecting coaxial cables or antennas to the instrument. This may be as simple as temporarily attaching a short or load device to the cable or antenna prior to attaching to the Spectrum 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.

RF Input Warning

The Anritsu Spectrum Master is a sensitive measuring instrument designed to measure low power levels. Avoid damaging this sensitive circuitry by observing the maximum input levels printed on the instrument connector labeling and specified in the product technical data sheet.

Typical maximum input is +23 dBm (± 50 VDC) and could be less if additional features, such as a preamplifier, are in use. Be sure to review the product technical data sheet or Anritsu website for recommended components and accessories that can help you protect your instrument. These include a variety of adapters, attenuators, filters, and RF power detection accessories.

Battery Replacement

The battery can be replaced without the use of tools. The battery compartment door is located on the lower left side of the instrument (when you are facing the measurement display). To remove the battery:

1. Push down on the battery door tab to disengage it.
2. Remove the battery door.
3. Pull straight out on the lanyard to remove the battery pack from the instrument.

Note

When inserting the battery, the battery label should face up and the end where the battery contacts are located slides in first. If the battery door does not close tightly, the battery may be inserted incorrectly.



Figure 1-1. Battery Compartment Door

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-DC Adapter, or outside the Spectrum Master with the optional Dual Battery Charger. Refer to “[Symbols and Indicators](#)” on page 2-12 for a description of battery symbols.

Note

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

Caution

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

Chapter 2 — Instrument Overview

2-1 Introduction

This chapter provides an overview of the Anritsu Spectrum Master. It describes the instrument front panel, touch screen display, and the connector panel. For detailed information on the instrument's test and measurement functions, refer to one of the Anritsu user documents listed in [Appendix A, "Related Documents"](#).

2-2 Turning On the Spectrum Master

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

Caution

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

To turn on the MS2720T, press the green On/Off button on the front panel (see [Figure 2-1 on page 2-2](#)).

The Spectrum Master takes approximately 60 seconds to complete power-up and to load the application software. At the completion of this process, the instrument is ready for use.

Note

Keep the fan inlet and exhaust ports clear of obstructions at all times for proper ventilation and cooling of the instrument.

2-3 Instrument Front Panel

The Spectrum Master uses a touch screen and keypad for data input. The five bottom menu keys and up to eight submenu keys on the right side of the display are touch screen keys. The menu and submenu keys vary depending on the current measurement mode, installed options, and instrument function selected.

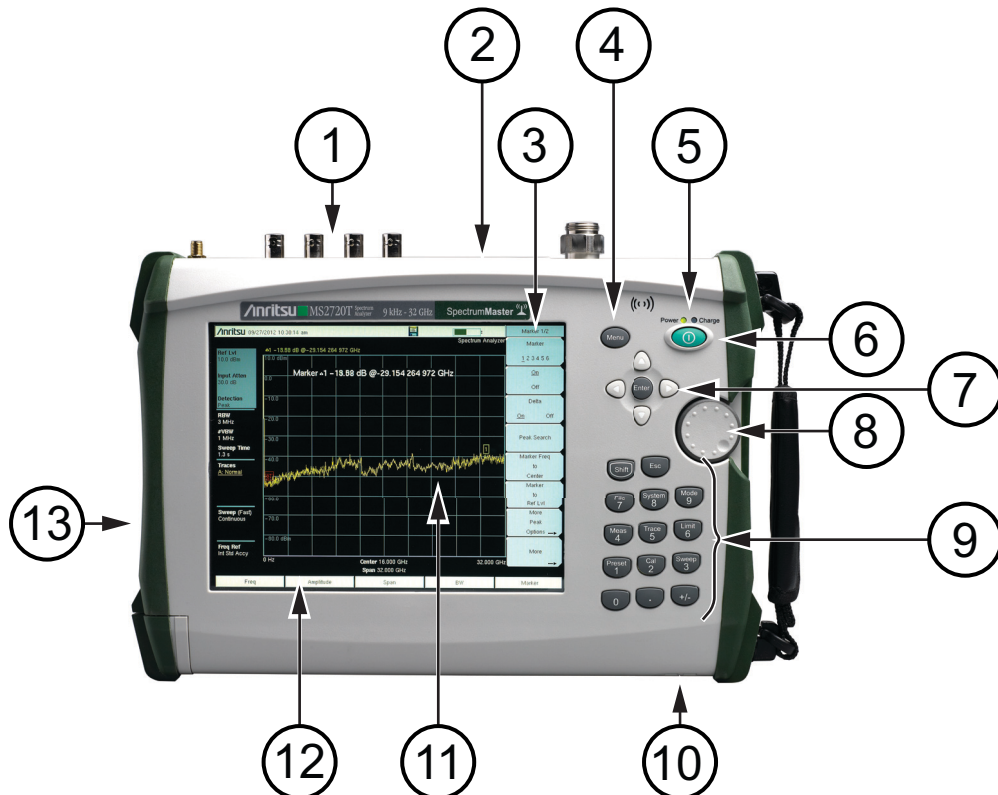


Figure 2-1. Front Panel Overview

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

LED Indicators

Power LED

The Power LED is located on the left of the **On/Off** button. The LED is solid green when the instrument is on, and blinks slowly when the unit is off but is connected to an external power source.

Charge LED

The Charge LED is located on the right of the **On/Off** button. The LED blinks slowly when the battery is charging and is solid green when the battery is fully charged.

Front Panel Keys

The numeric keypad, rotary knob, and the four arrow keys can all be used to change the value of the currently selected parameter.

Numeric Keypad

Keys 0 through 9 are used for numeric input, with an alternate function printed in blue above each of the keys. Press the **Shift** key, then a numeric key, to access the instrument menu or function indicated by the key label.

Some of the alternate functions associated with the numeric keypad are not available in all measurement modes. Refer to the Measurement Guides listed in [Appendix A](#).

Shift Key

Pressing the **Shift** key followed by a number key executes the function that is indicated in blue above the number key. When the **Shift** key is active, its icon is displayed at the far right of the title bar, above the sweep window.

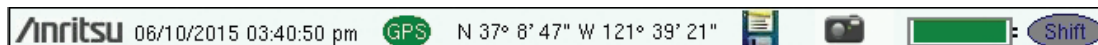


Figure 2-2. Shift Key Icon in Title Bar

Esc Key

Press this key to cancel the parameter change being made and exit the current menu function, if applicable.

Arrow Keys

The four arrow keys are used to scroll through a list and highlight the item you wish to select, or to change the value of the currently selected parameter. The arrow keys can also be used to move markers. The rotary knob performs similar functions.

Enter Key

Press this key to apply a parameter value or instrument setting you have entered, or to select a highlighted item from a list.

Rotary Knob

Turn the rotary knob to change numerical values, scroll through selectable items in a list, or to move markers. Values or items may be within a dialog box or an edit window.

Menu Key

The **Menu** key displays a grid of shortcut icons for installed measurement modes and user-selected menus and setup files. See [Figure 2-3](#). Press one of the icons in the top three rows to change modes. These icons are preinstalled and cannot be moved or deleted.

An alternative to the **Menu** key is to press **Shift**, then the **Mode (9)** key to display the Mode Selector list box. Refer to [“Mode Selector” on page 2-18](#).

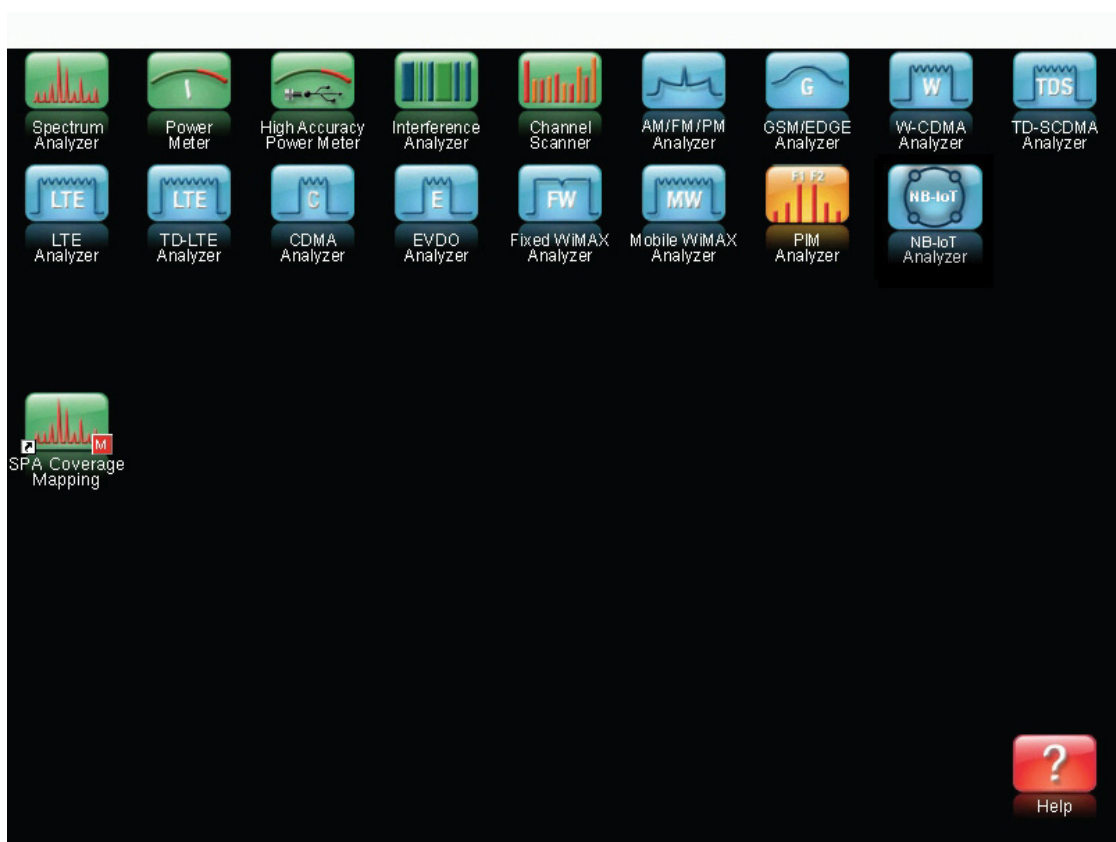


Figure 2-3. Menu Key Screen

Note

Shortcut icons displayed in the top rows of the Menu screen vary with the instrument model, firmware version, and installed options. Help for the Menu screen is available by pressing the icon in the lower-right corner of the display.

User-Created Shortcuts

To create a shortcut to any submenu key or main menu key, press and hold the key until a grid appears, showing the open locations on the Menu screen where you can place the new shortcut. Press one of the cells in the displayed grid to place the shortcut. See [Figure 2-4](#).

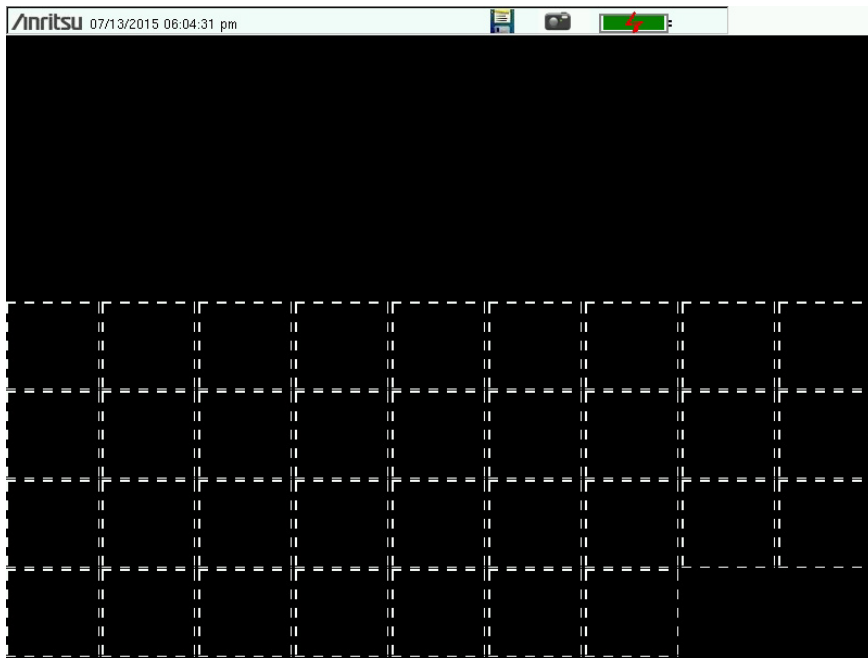


Figure 2-4. Placement Grid for User-Created Shortcuts

To create a shortcut to a setup file (.stp), press **Recall** under the File menu, then press and hold the desired file name until a grid is displayed. Select the display location of the new shortcut as described above.

User-defined shortcuts remain on the Menu screen until deleted. To delete or move a shortcut icon, press the **Menu** key, then press and hold the shortcut until the Customize Button dialog appears. See [Figure 2-5](#). Press the appropriate button to delete or move the shortcut icon.

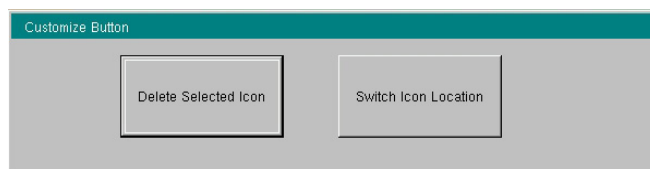


Figure 2-5. Customize Button Dialog

Press **Esc** to close the dialog without deleting or moving the shortcut. Also use **Esc** to exit the Menu screen.

2-4 Connector Panel

Figure 2-6 shows the connector panel on the MS2720T with lower frequency options (up to 20 GHz), which also have the Tracking Generator option available.

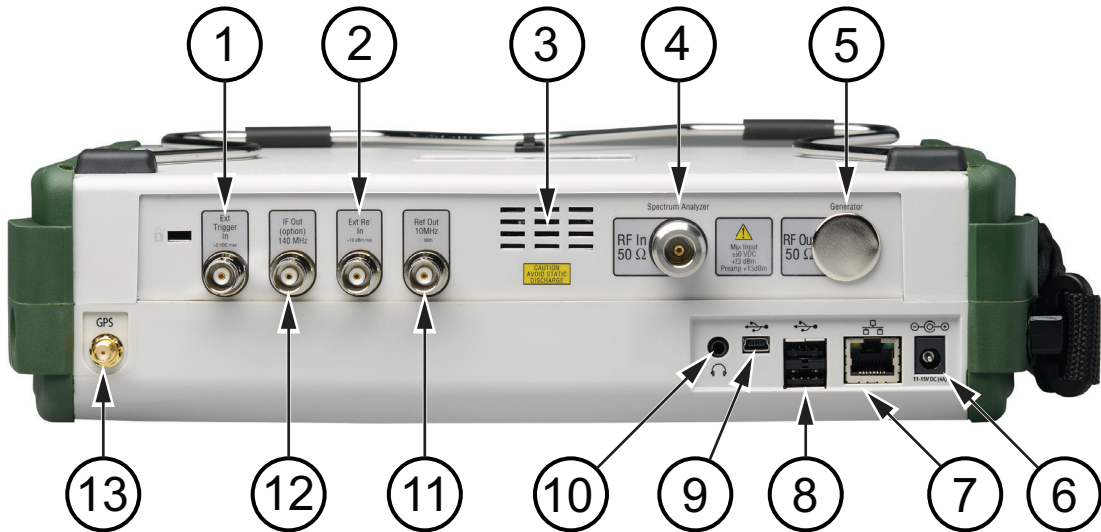


Figure 2-6. Test Panel Connectors for MS2720T Options 709, 713, 720

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 connector panel shown in [Figure 2-7](#) is for the two higher frequency options (32 GHz and 43 GHz).

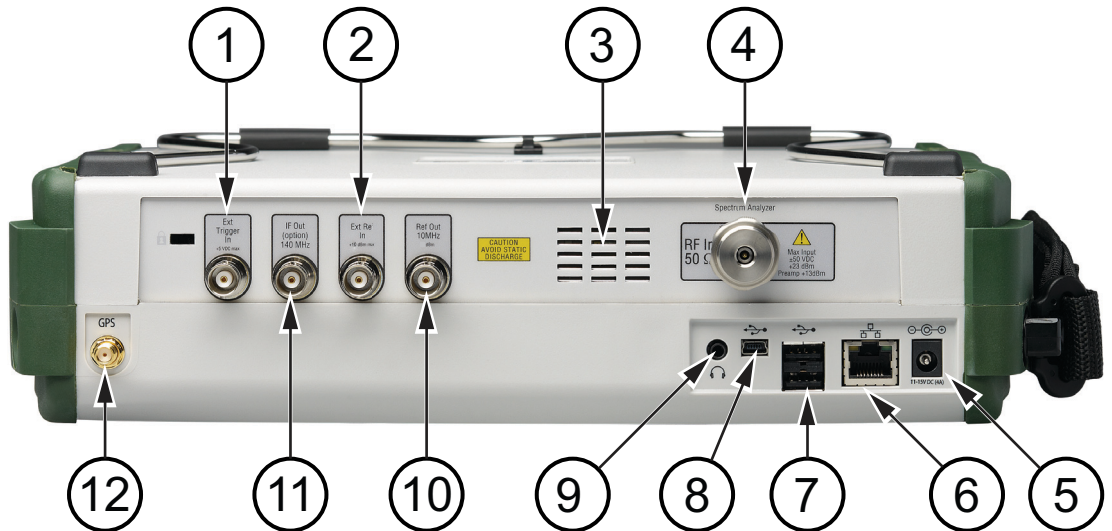


Figure 2-7. Test Panel Connectors for MS2720T Options 732, 743

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 triggering occurs on the rising edge of the signal. After the sweep is complete, the resultant trace is displayed until the next trigger signal arrives.

Ext 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 and input levels. To prevent damage to your instrument, do not use pliers or a wrench to tighten the BNC connector or overpower the input.

RF In

Warning

To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the connector. Do not overtighten the connector. Do not overpower the RF Input. Refer to your technical data sheet for valid frequencies and input levels. Typical maximum input is +23 dBm (± 50 VDC).

MS2720T-0709, MS2720T-0713, MS2720T-0720: Type N(f), 50 Ω connector. The recommended torque is 12 lbf · in to 15 lbf · in (1.36 N · m to 1.70 N · m).

MS2720T-0732, MS2720T-0743: Type K(f), 50 Ω ruggedized 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 blinking LED near the Power button indicates that the instrument battery is being charged by the external charging unit. The indicator is a steady green when the battery is fully charged.

Warning

When using the AC-DC 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, the user is at risk of receiving a severe or fatal electric shock.

Refer to [“External Power On” on page 3-11](#) and [“Power-On Menu” on page 5-6](#) when controlling the Spectrum Master via external power.

LAN Connection

The RJ-45 connector is used to connect the Spectrum Master to a local area network or directly to a PC with an Ethernet crossover cable. 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 more information on the LAN connection, Ethernet connection, and DHCP, refer to [Chapter 8](#) and [Appendix D, “LAN and DHCP”](#).

USB Interface – Type A

The Spectrum Master has two Type A USB connectors that accept USB Flash Memory devices for storing measurements, setup data, and screen images.

USB Interface – Type Mini-B

The 5-pin mini-B USB 2.0 interface can be used to connect the 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. A Windows driver is installed when Master Software Tools is installed. Drivers are available for versions of the Windows XP operating system and later. During the driver installation process, specify that the installation wizard should search the Master Software Tools directory 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 -7 dBm to 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 female 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-female. GPS function is described in [Chapter 6](#).

2-5 Interface Screen

Figure 2-8 illustrates the Spectrum Master interface screen in Spectrum Analyzer mode, with touch screen menu keys, title bar, and measurement settings and results around the graph area, or sweep window.

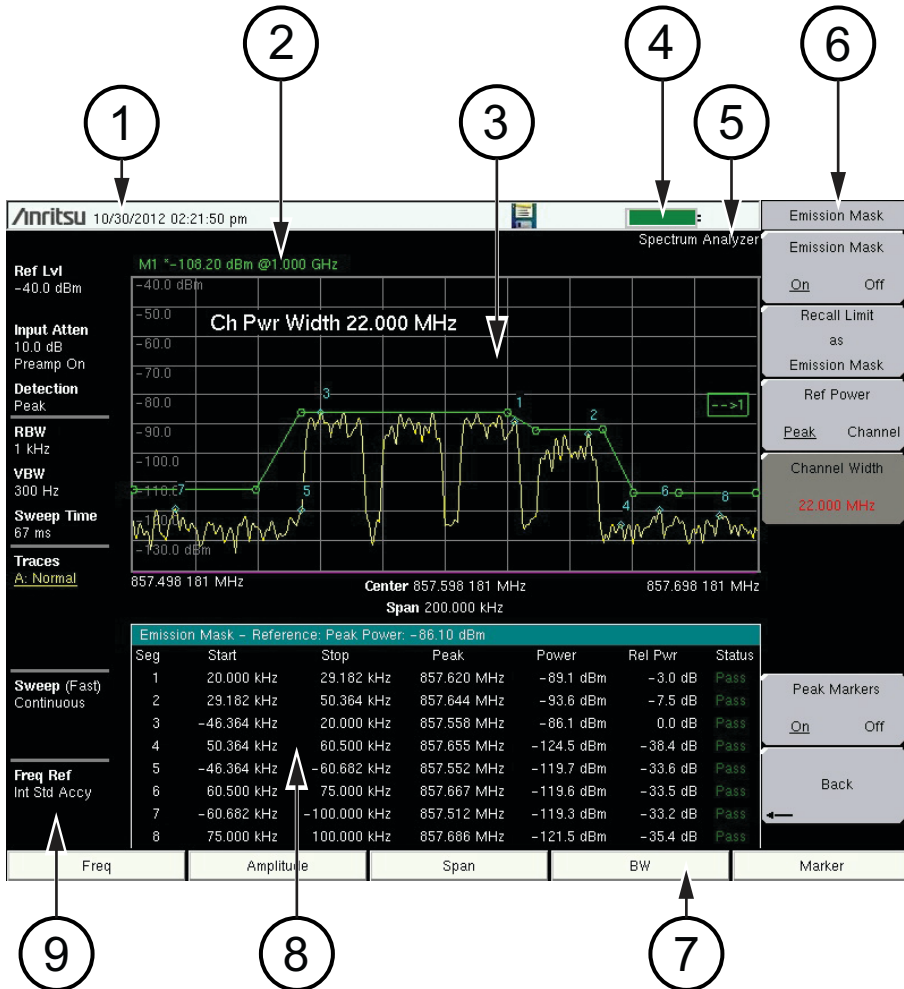


Figure 2-8. Spectrum Analyzer Display

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

Note Many of the measurement settings displayed to the left and the top of the sweep window are touch screen shortcuts to the corresponding menus.

Touch Screen Keys

Main Menu Touch Screen Keys

There are five main menu keys horizontally arranged along the bottom of the interface screen. These keys give access to the instrument's test and measurement functions, which are documented in the applicable Measurement Guide. Refer to [Appendix A, "Related Documents"](#).

Different operation or measurement modes may display different main menu keys. To switch to another mode, press the **Menu** key, or press **Shift** followed by the **Mode** (9) key.

Note The installed options determine what measurement modes are available. Refer to [Table 1-2 on page 1-4](#).

Submenu Touch Screen Keys

Most of the instrument setup, control, and measurement functions are performed through the use of the submenu keys along the right side of the display. The key labels change as measurement settings and instrument setup parameters change. The current submenu title is displayed at the top of the submenu key block, which consists of up to eight touch screen keys. See [Figure 2-8 on page 2-10](#).

Symbols and Icons on the Title Bar

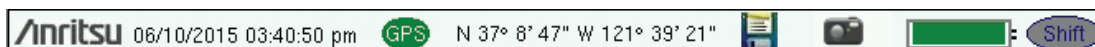


Figure 2-9. Title Bar with Icons

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

Press 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 4-10](#) is equivalent to pressing **Shift** and **File** (7), then **Save**. Refer to ["Save Dialog Box" on page 4-3](#).

Press the camera icon to save a JPEG image of the current screen display.

The battery symbol indicates the charge remaining in the battery. The colored section inside the symbol changes size and color with the charge level. See [Table 2-1 on page 2-12](#). 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.

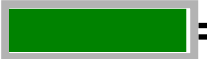










Caution Use only Anritsu-approved batteries, adapters, and chargers with this instrument. Anritsu recommends removing the battery for long-term storage of the instrument.

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

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 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 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 Button with Power LED and Charge LED: This is a physical button with LED indicators. It is located near the numeric keypad.

Display Settings

The Display Settings submenu lets you adjust the screen brightness level and control the auto-dimming function. Refer to [“Brightness Settings Menu” on page 5-8](#).

You can also turn off the display entirely, as described in [“Display Settings Menu” on page 5-7](#). To turn the display back on, press any key (except the Power button) three times in rapid succession.

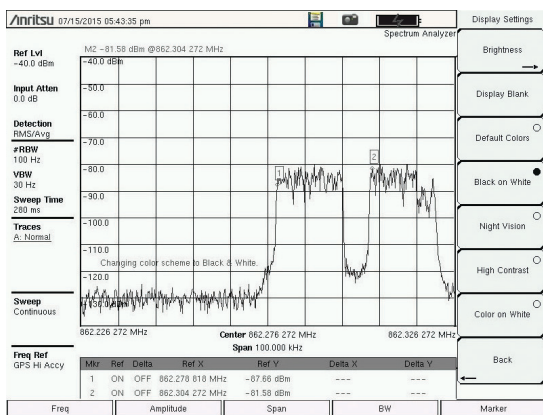
In addition to the default display colors shown in [Figure 2-8 on page 2-10](#), you can select different color schemes to suit the ambient lighting conditions. See [Figure 2-10](#). Some color settings may not be available in all measurement modes.

Black on White — used for printing and viewing in broad daylight conditions

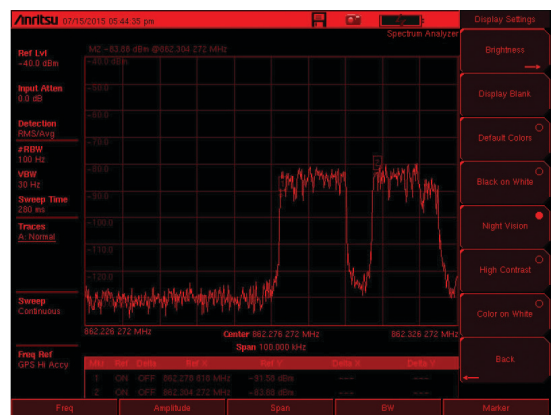
Night Vision — optimized for nighttime viewing

High Contrast — used in challenging viewing conditions

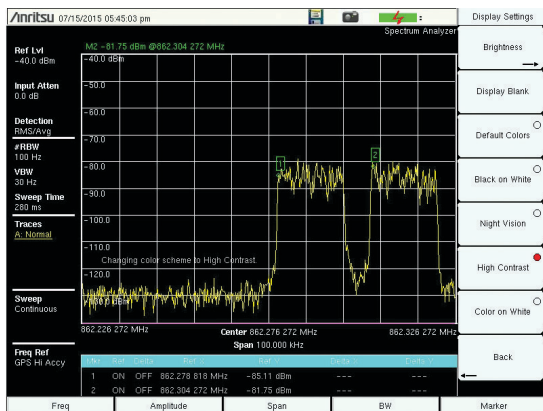
Color on White — used for printing and viewing in broad daylight conditions



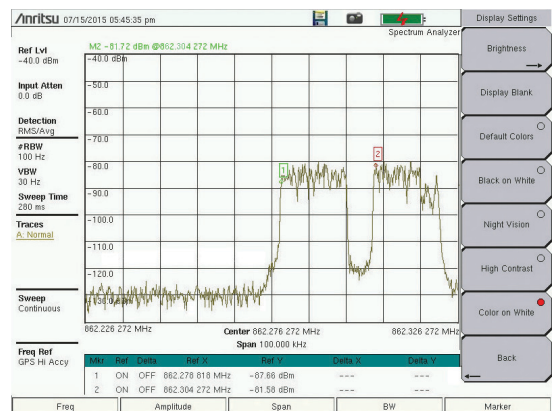
Black on White



Night Vision



High Contrast



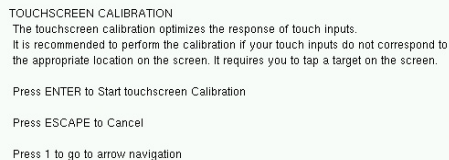
Color on White

Figure 2-10. Spectrum Master Display Color Settings

Touch Screen Calibration

Calibration optimizes the response of touch input. It is recommended if the instrument does not respond as expected when you press the touch screen.

The Calibrate Touch Screen submenu key is in the “[System Menu](#)” on page 5-3. When pressed, a message box is displayed with instructions for calibration. See [Figure 2-11](#). Press **Enter** to begin calibration, or press **Esc** to cancel. Alternatively, you can press **1** while the message box is displayed to use the arrow keys for navigation. Refer to “[Disable Touch Screen to Use Arrow Navigation](#)”.



TOUCHSCREEN CALIBRATION
 The touchscreen calibration optimizes the response of touch inputs.
 It is recommended to perform the calibration if your touch inputs do not correspond to the appropriate location on the screen. It requires you to tap a target on the screen.

Press ENTER to Start touchscreen Calibration

Press ESCAPE to Cancel

Press 1 to go to arrow navigation

Figure 2-11. Touch Screen Calibration Message Box

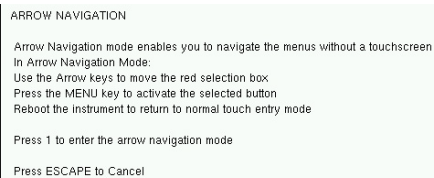
During calibration, press the crosshairs in sequence as they appear on the screen. The process takes less than one minute.

Calibrate Touch Screen Shortcut

Another way to access touch screen calibration is to press **Shift**, then **0** (zero). This displays the touch screen calibration message box shown in [Figure 2-11](#). The 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 (see [Figure 2-11](#)), press **1** to display the arrow navigation message box, illustrated in [Figure 2-12](#). Press **1** again to enter the arrow navigation mode, or press **Esc** to cancel.



ARROW NAVIGATION

Arrow Navigation mode enables you to navigate the menus without a touchscreen

In Arrow Navigation Mode:

Use the Arrow keys to move the red selection box

Press the MENU key to activate the selected button

Reboot the instrument to return to normal touch entry mode

Press 1 to enter the arrow navigation mode

Press ESCAPE to Cancel

Figure 2-12. Arrow Navigation Message Box

In arrow navigation mode, a red border highlights the currently selected key (see [Figure 2-13](#) on page 2-15). Use the arrow keys to move the red selection box, then press the **Menu** key to activate the highlighted key. 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, like the display title bar, sweep window, or the instrument settings area on the left.

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 4-9](#).

You can save a JPEG image of the current display screen by pressing **Shift**, followed by **Decimal**, then **+/-**. The JPEG 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, then On). If your touch screen has been damaged, refer to [“Contacting Anritsu for Sales and Service” on page 1-2](#).

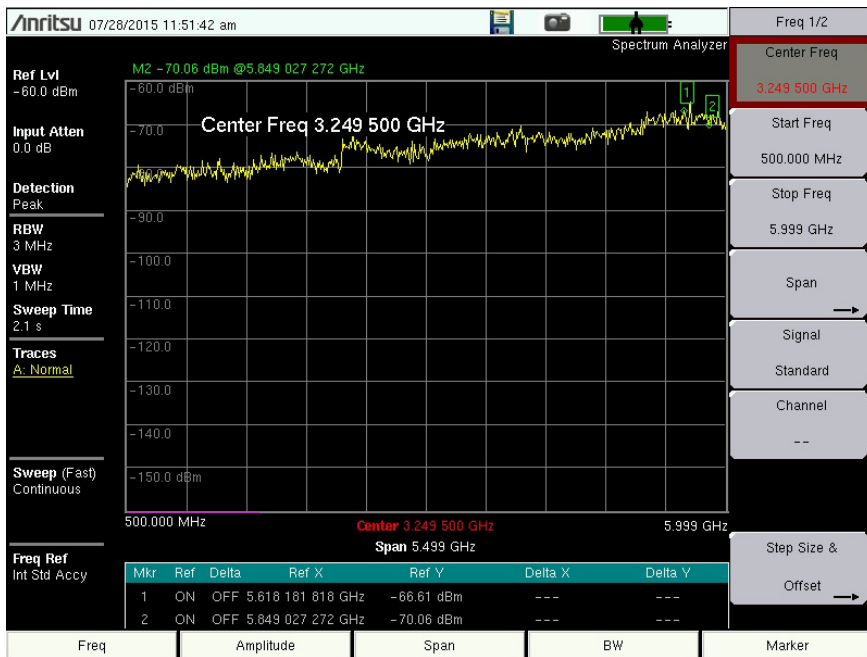


Figure 2-13. Arrow Navigation Example

2-6 Data Entry

User input can be in the form of numeric values for instrument or measurement settings, selected values from a preset list, or alphanumeric text when entering file names, for example. To view or change a parameter value, access the appropriate submenu by pressing one of the five main menu keys along the bottom of the interface screen, then navigating through the touch screen submenus.

Other instrument functions are accessible from the numeric keypad, when used in combination with the **Shift** key. Refer to “[Numeric Keypad](#)” on page 2-3. Some of the parameter settings displayed on the left of the interface screen or under the title bar are touch screen shortcuts to related submenus.

Depending on the measurement mode, refer to the associated Measurement Guide listed in [Appendix A](#) for a description of available menus and submenus.

Numeric Values

To modify a numeric parameter setting that is displayed on a submenu touch screen key, press the key to make it active. The display color of the currently set value changes to red. Use the rotary knob, arrow keys, or the numeric keypad to change the value. When entering a value from the keypad, the submenu typically shows the selectable units. Press the desired unit or press **Enter** to complete the entry.

Selection Lists

Some parameters and instrument functions are selectable from a pop-up list. These list boxes display the available selections, and value limits if applicable. Use the arrow keys or the rotary knob to scroll through the list and highlight the desired entry. You can also use the touch screen to make your selection.

To apply the selection, press **Enter**. To exit the selection list without making a change, press the Escape (**Esc**) key.

Text Entry

When an instrument function requires you to enter text, such as a name for a measurement or setup file you wish to save, a touch screen keyboard is displayed. See [Figure 2-14](#). Digits can be entered using the touch screen keyboard or the front panel keypad. The left and right arrow keys move the insertion point in the file name edit box.

Refer to [“Save Dialog Box” on page 4-3](#) for information on saving files.

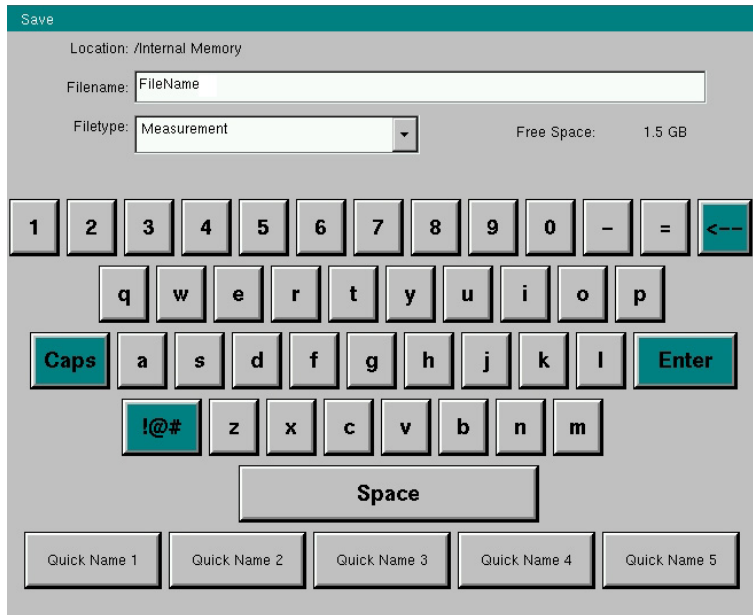


Figure 2-14. Touch Screen Keyboard

2-7 Mode Selector

To change to another application or measurement mode, press **Shift**, then the **Mode (9)** key to display the Mode Selector list box, illustrated in [Figure 2-15](#). Use the directional arrow keys or the rotary knob to highlight the desired mode, then press **Enter** to switch to the selected application. The measurement modes available for selection depend on the options that are installed and activated on your instrument.

An alternate method of selecting a measurement mode is through the use of the “[Menu Key](#)” on [page 2-4](#).

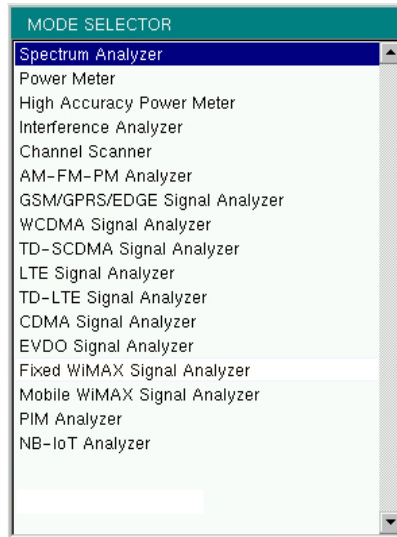


Figure 2-15. Mode Selector List Box

2-8 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 2-16. 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.

2-9 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, refer to [“Connector Panel” on page 2-6](#).

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 2-4](#).

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” 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 (see [Figure 2-8 on page 2-10](#)).

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.

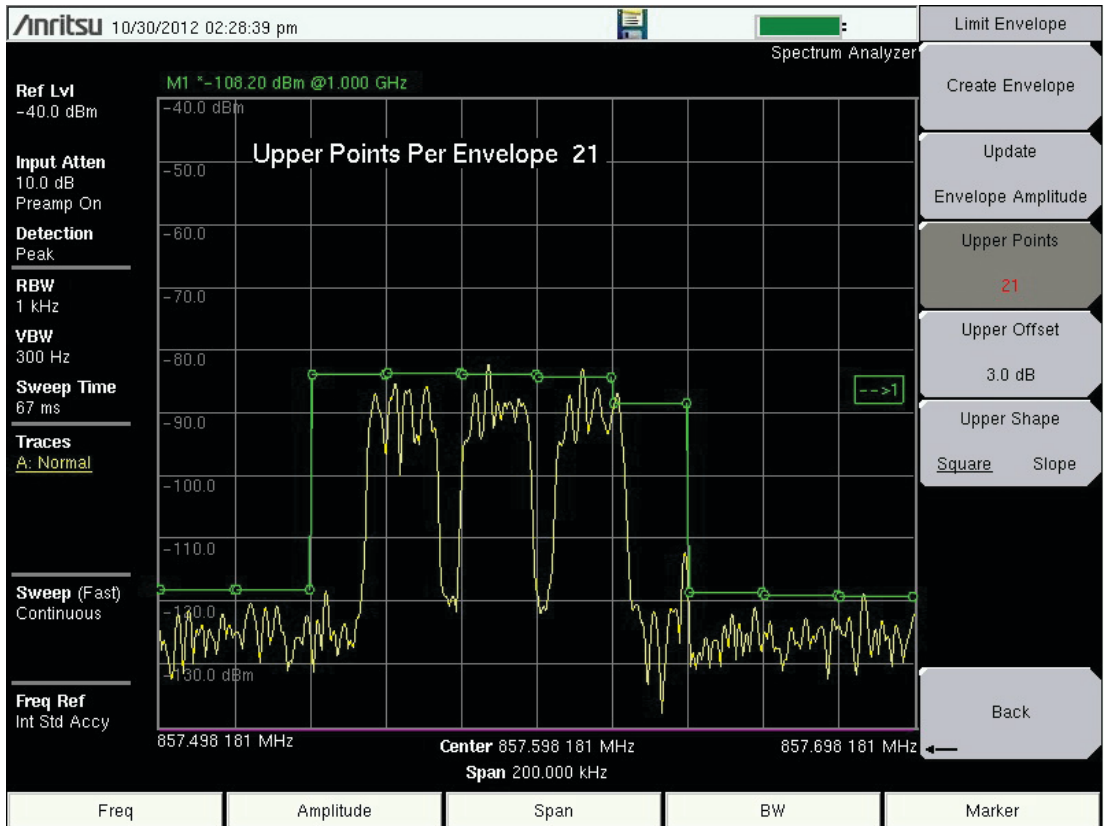


Figure 3-1. Complex Limit Line Example

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

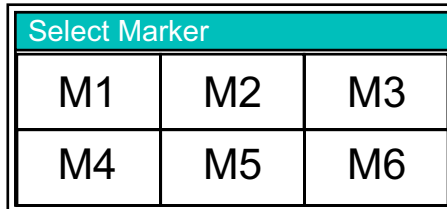


Figure 3-2. Marker Selection Box

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.

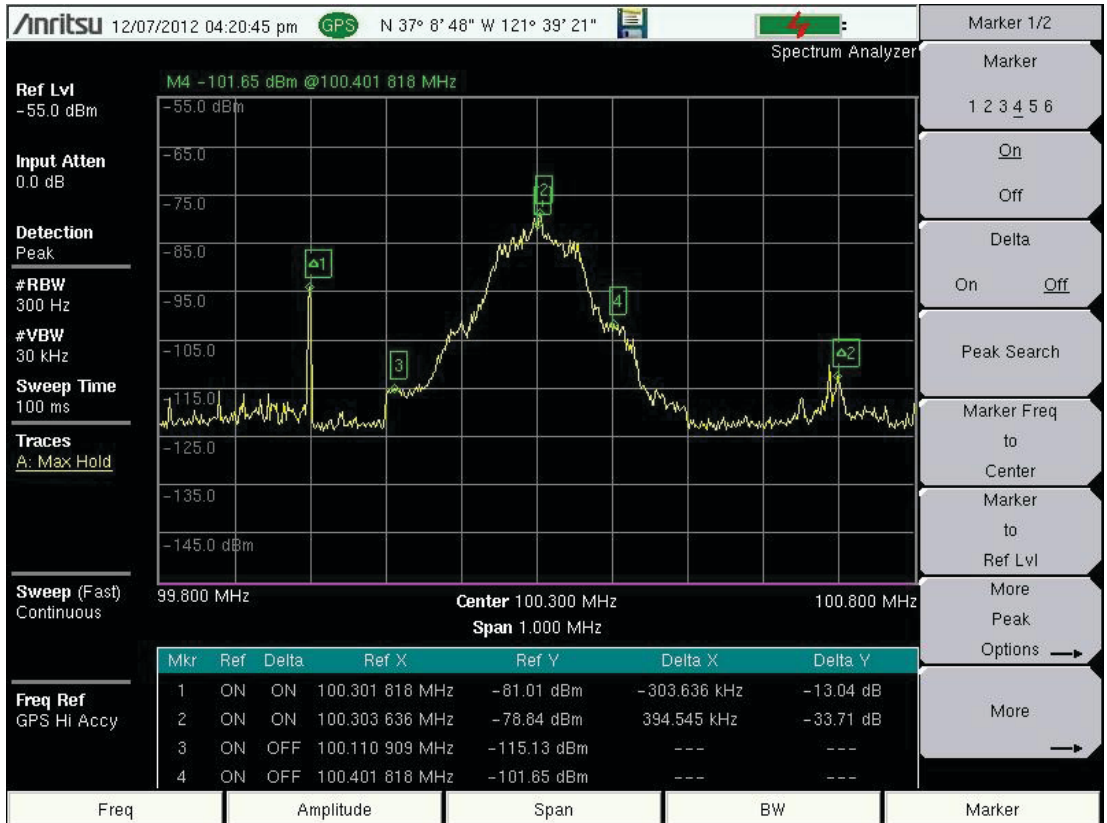


Figure 3-3. Markers with Table

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 marker 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 Software Tools

Anritsu provides a suite of Microsoft® Windows® compatible software for transferring and editing saved measurements, markers, and limit lines to a PC. Refer to [Chapter 7, “Anritsu Tool Box”](#) for an overview of these products.

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 2-7 on page 2-7](#). Refer to [“External Power” on page 2-8](#) and the [“Power-On Menu” on page 5-6](#).

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 related touch screen menus. The File menu and its submenus 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.

Note When navigating through the File menu, press the **Esc** key to return to the previous menu or submenu. Any changes not yet applied (by pressing Enter) are canceled.

File Types

Under the Save, Recall, Copy, and Delete menus, press the **Change Type** or the **File Type** submenu key to open the Select File Type list box, where you can select the desired file type.

Available file types depend on the current instrument mode. The Select File Type list box may contain 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, *.wmx, *.wmxs, *.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 [Figure 4-1 on page 4-2](#).

Save Files

The submenu keys that are available for file management may vary with instrument options and measurement modes. Refer to “[File Menu](#)” on page 4-9.

Save Measurement As

The Save Measurement As submenu key provides a one-touch method of saving the current measurement data. The name of the file that will be saved is displayed on the submenu key. The numerical suffix increments by 1 following the Save. For example, if the last measurement was saved with the file name ACPR, the Save Measurement As shows the default file name for the next measurement to be saved as ACPR_1, then ACPR_2, and so on. To save using a different file name than the default, press the Save Measurement key or the Save key instead of Save Measurement As.

Save Measurement

To save the current measurement data, use the Save Measurement As submenu key described above or, to apply a different file name or save location than the default, press the Save Measurement submenu key or the Save key. In the Save dialog, you can enter the file name and select the type of data to save. See [Figure 4-1](#) and refer to “[Save Dialog Box](#)” on page 4-3.

Save

The Save submenu key has the same function as Save Measurement. It opens the Save dialog box and menu illustrated in [Figure 4-1](#).

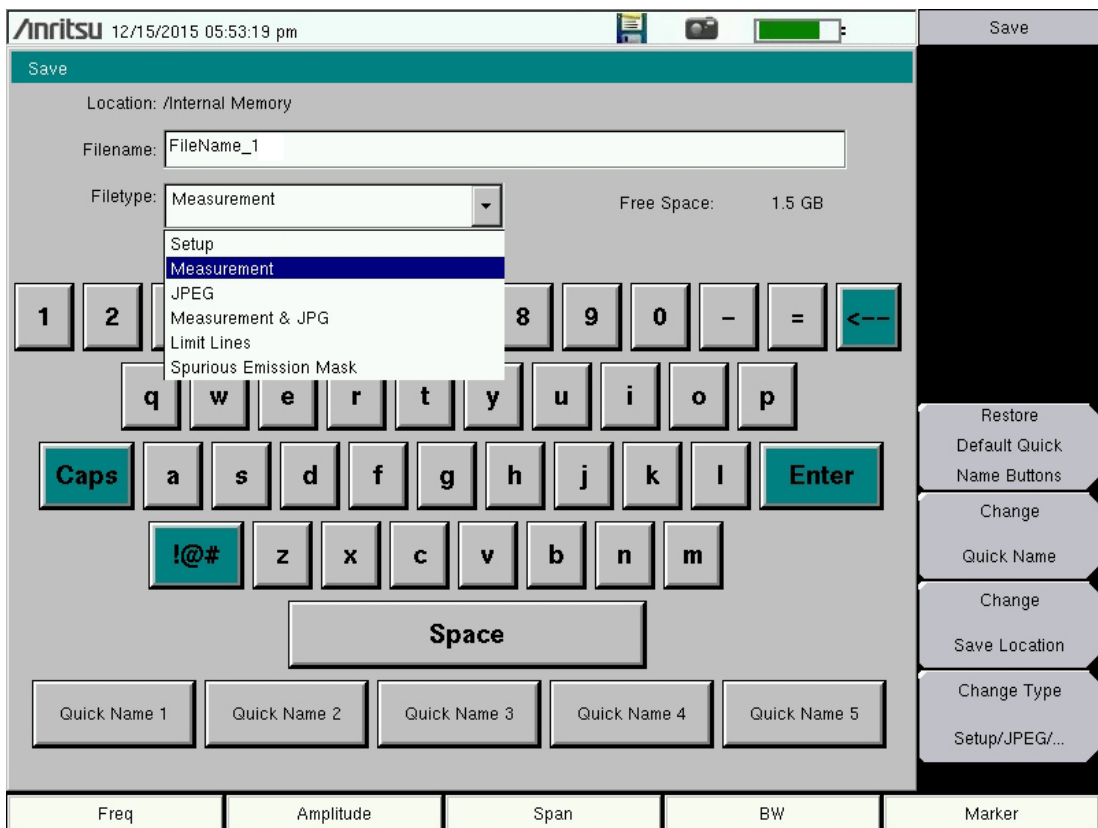


Figure 4-1. Save Dialog Box

Save Dialog Box

In the Save dialog, use the touch screen keyboard to enter the name of the file to save. See [Figure 4-1 on page 4-2](#). Optionally, you can use the Quick Name keys to insert preset text strings into the file name. Refer to [“Quick Name Keys”](#).

To select the type of data to save, either press the Filetype selection box to display the drop down list of available file types, or press the **Change Type** submenu key. Selectable file types vary with the measurement mode. Use the **Up/Down** arrow keys to highlight the desired file type, then press **Enter** to select.

Press **Enter** again to save the file. File name extensions are automatically assigned based on the file type and measurement mode. Refer to [“File Types” on page 4-1](#).

Quick Name Keys

Quick Name keys in the Save dialog provide optional building blocks for entering file names. They function as keyboard shortcuts, allowing you to enter predefined, frequently used file names or parts of file names. To enter or change a Quick Name, press the **Change Quick Name** submenu key in the Save menu, then select the item to edit (see [Figure 4-2](#)) and press **Enter** on the numeric keypad. In the Edit Quick Name dialog, use the touch screen keyboard to enter a new Quick Name. See [Figure 4-3](#). Press **Enter** again and the new name will be displayed on the key, in the Save dialog.



Figure 4-2. Select Quick Name List Box

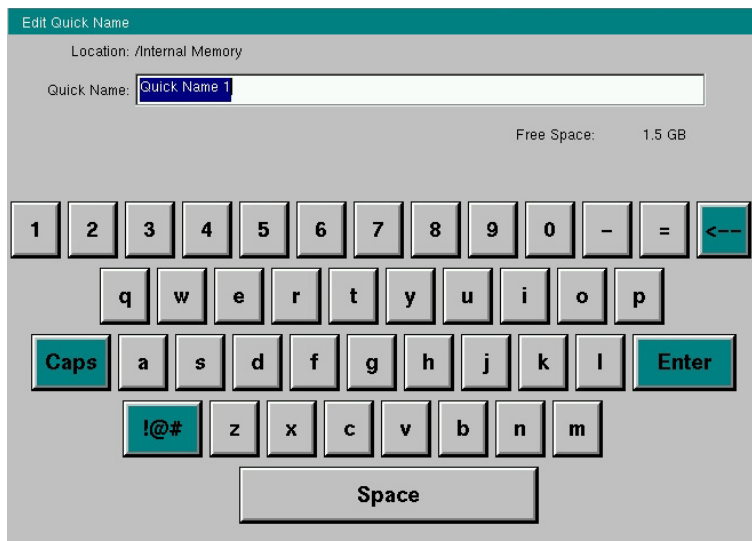


Figure 4-3. Edit Quick Name Dialog Box

Change Save Location

You can save files to internal memory or to an external USB flash drive. To change the destination location of the saved file, press the **Change Save Location** submenu key under the **Save** menu. [Figure 4-4](#) illustrates the directory structure of the instrument's internal memory and external USB drive or drives, if connected. Only folders are listed, not files.

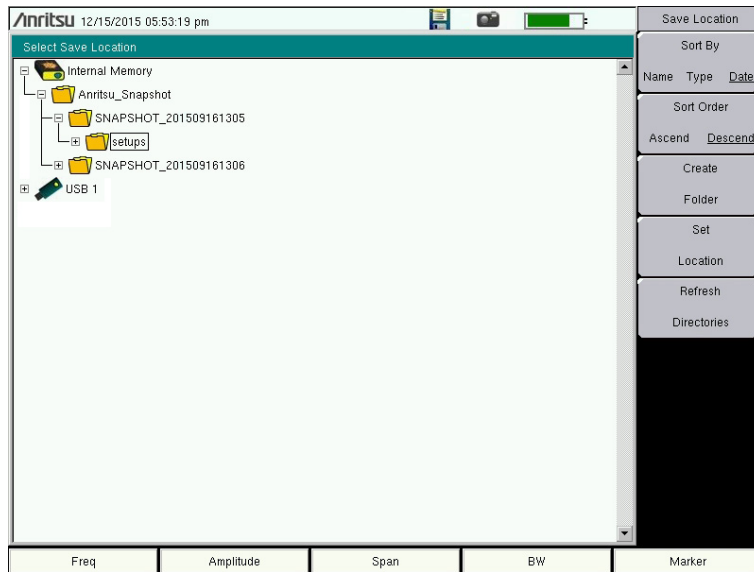


Figure 4-4. Save Location Screen

Use the touch screen, the **Up/Down** arrow keys, or the rotary knob to select a folder from the list. 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. To create a new folder, press the **Create Folder** submenu key.

After selecting the folder, press the **Set Location** key to store the save location. Refer to [“Save Location Menu” on page 4-11](#) for a description of the submenu keys.

Save On Event

This menu is not available in all modes of operation. The menu is used to automatically save measurement data to the current save location after a selected event type. Refer to [“Save On... Menu” on page 4-12](#).

Recall Files

Press the **Recall Measurement** key or the **Recall** key under the **File** menu to recall a previously saved file from internal memory or an external USB drive, if connected. The files listed in the Recall dialog box depend on the file type selected. See [Figure 4-5](#). JPEG image files cannot be recalled.

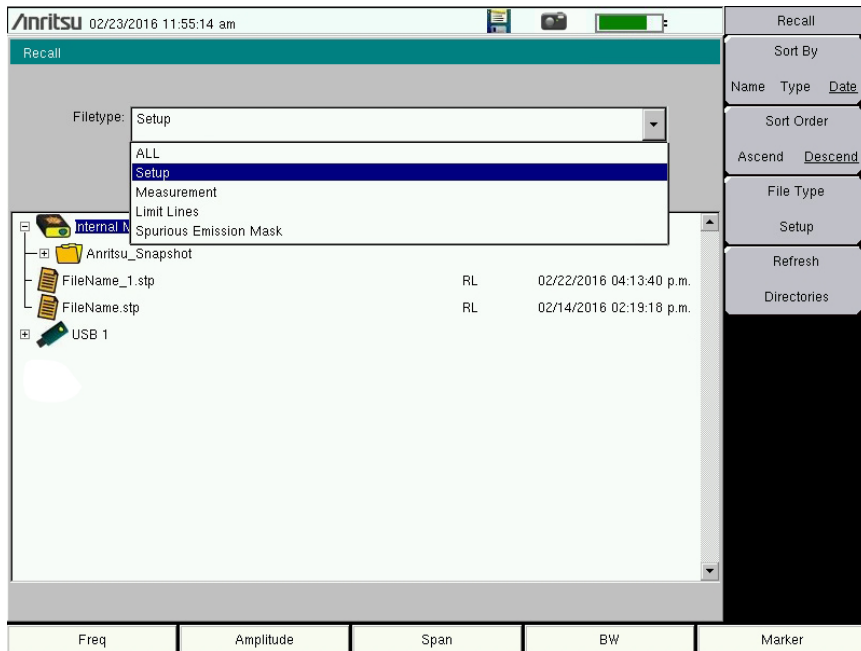


Figure 4-5. Recall Dialog Box

The submenu keys let you change the file types and sort order of the displayed file list. Refer to [“Recall Menu” on page 4-13](#).

The Filetype drop down list has the same function as the **File Type** submenu key. Selectable file types vary with the measurement mode. Use the touch screen, rotary knob, or the **Up/Down** arrow keys to select the file you wish to recall, then press **Enter**.

From the Recall dialog box, you can create a shortcut to a setup file and place the shortcut icon on the instrument’s Menu screen. Refer to [“User-Created Shortcuts” on page 2-5](#).

Copy Files

Press the Copy key under the File menu to open the Copy dialog box and menu, where you can copy a single or multiple files or folders. The source and destination locations may be the instrument's internal memory or an external USB drive, if connected. The source files listed in the Copy dialog box depend on the chosen file type, which is selected using either the Filetype drop down list or the File Type submenu key. You can also change the way folders and files are sorted in the displayed list. Refer to [“Copy Menu” on page 4-14](#).

The Filetype drop down list has the same function as the File Type submenu key. Selectable file types vary with the measurement mode. Files and folders to copy are listed in the top pane of the Copy dialog box. Select the destination in the bottom pane. See [Figure 4-6](#).

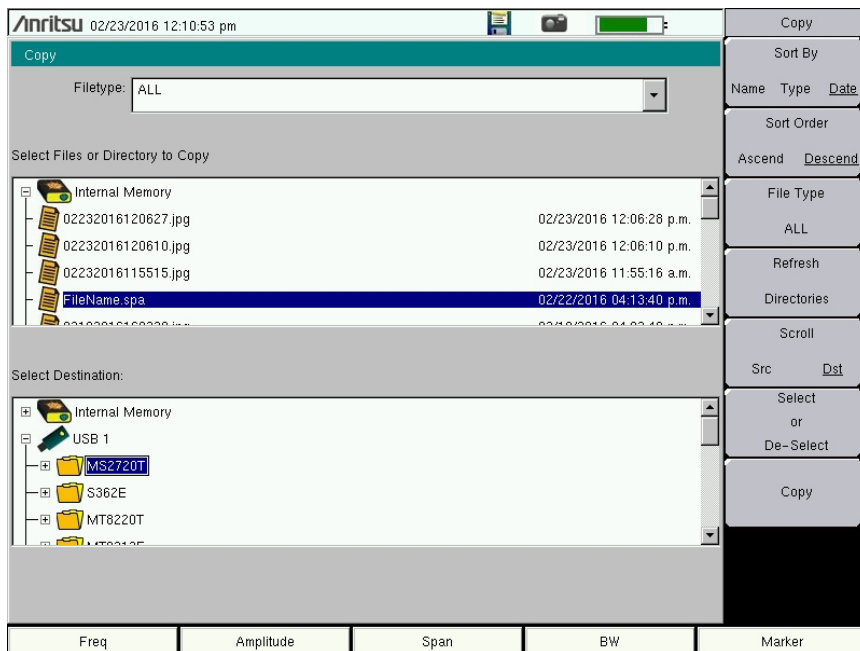


Figure 4-6. Copy Dialog Box

1. To copy to or from an external USB drive, insert the flash drive into a USB port on the instrument. Otherwise, skip to the next step.
2. Press the **Shift** key, followed by **File (7)**, then press the Copy submenu key.
3. Use the submenu keys to select the type of file to copy and the display order of folders and files, as appropriate.
4. Make sure the **Scroll** submenu key is toggled to Src (source).
5. Use the touch screen, rotary knob, or the **Up/Down** arrow keys to locate and highlight (that is, frame) the file or folder you wish to copy. To open a highlighted folder, press **Enter**. Press **Enter** again or press the **Left** arrow key to close it.
6. To select a highlighted file or folder for copying, press the **Select** or **De-Select** submenu key. The selected item is highlighted in blue.
7. If needed, repeat [Step 5](#) and [Step 6](#) to select more files or folders to copy.

8. Press the **Scroll** key to switch navigation control to the Dst (destination) pane. Alternatively, you can directly press a folder in the bottom pane to select it.
9. If the destination folder is off the screen, use the rotary knob or the **Up/Down** arrow keys to locate and select it.
10. Press the **Copy** key to copy the selected files or folders.

If a file by the same name already exists in the destination location, an error message is displayed, prompting you to press **Enter** to overwrite, or **Esc** to skip the conflicting file.

Delete Files

Press the **Delete** key under the File menu to open the Delete dialog box and menu, where you can delete a single or multiple files or folders. Items to be deleted may be in the instrument's internal memory or an external USB drive, if connected. However, you cannot select files and folders located in different drives simultaneously.

The files listed in the Delete dialog box depend on the chosen file type, which is selected using either the Filetype drop down list or the **File Type** submenu key. You can also change the way folders and files are sorted in the displayed list. Refer to [“Delete Menu” on page 4-15](#).

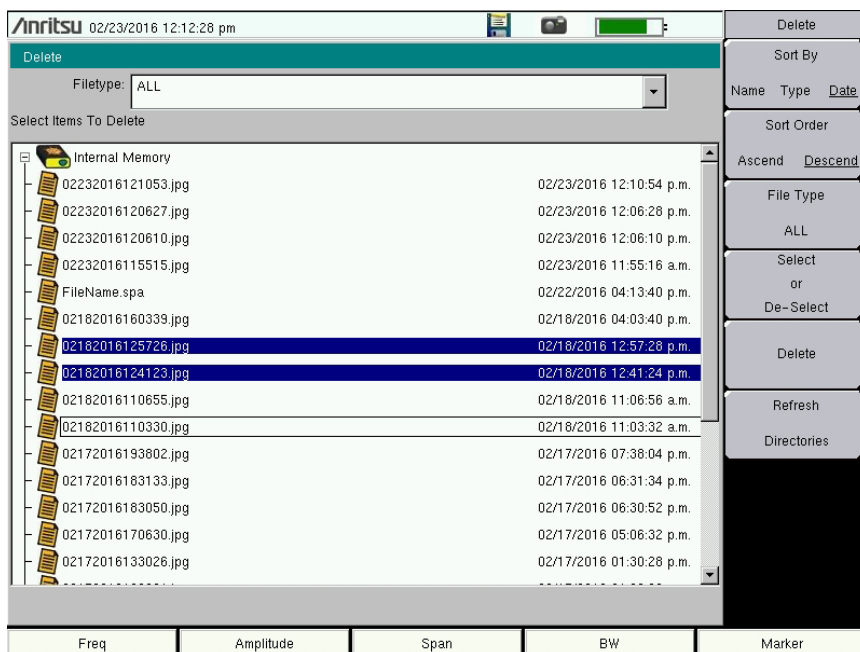


Figure 4-7. Delete Dialog Box

Use the touch screen, rotary knob, or the **Up/Down** arrow keys to highlight the file or folder you wish to delete. Then, press the **Select** or **De-Select** submenu key. The selected item is highlighted in blue. Pressing the key again deselects the current item.

To delete multiple files or folders, scroll to the next item and press the **Select** or **De-Select** key. Press the **Delete** key, then confirm or cancel the deletion in the confirmation box.

4-3 File Menu Overview

Open this menu by pressing the **Shift** key, then the **File (7)** key.

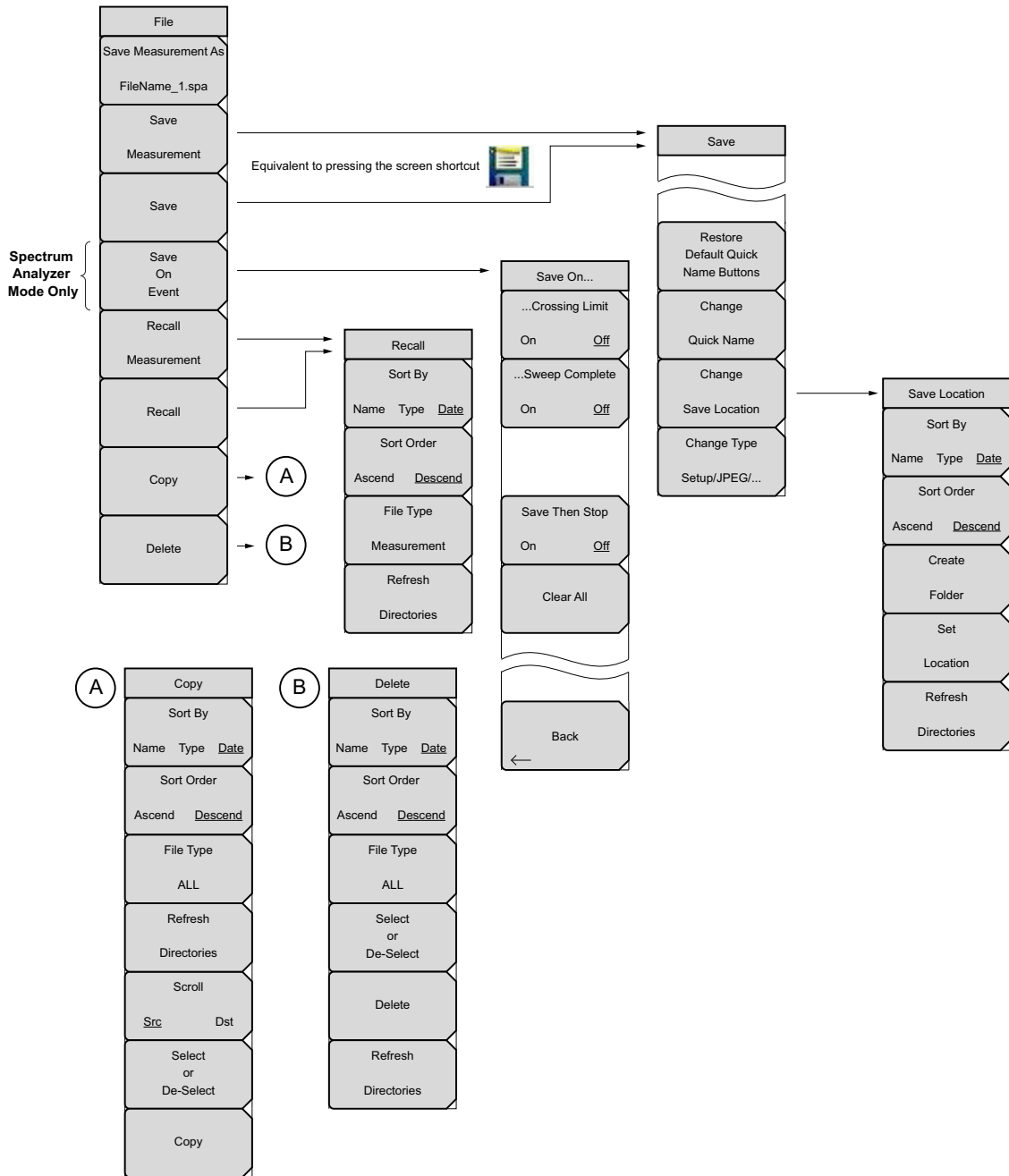


Figure 4-8. File Menu

4-4 File Menu

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

File	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.
Save Measurement As FileName_1.spa	
Save Measurement	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	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 list, as illustrated in Figure 4-11 on page 4-10 . The list of available file types varies with the measurement mode.
Save On Event	Press Enter to save to the named file and return to the File menu. Pressing Esc exits the Save menu and dialog without saving.
Recall Measurement	The destination file 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 4-11.
Recall	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.
Copy	Save on Event (Not available in all measurement modes): Press this submenu key to display the “ Save On... Menu ” on page 4-12.
Delete	Recall Measurement: Press this submenu key to display the “ Recall Menu ” on page 4-13. 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 4-13. The available settings are the same as those of the Recall Measurement key. 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. The source and destination locations may be the instrument’s internal memory or an external USB drive.
	Delete: Press this submenu key to display the “ Delete Menu ” on page 4-15 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 4-9. 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 key to change the Quick Names at the bottom of the touch screen keyboard (see Figure 4-11). 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 Setup/JPEG/... Press this submenu key to open the Select File Type list box and the "File Type Menu" .

Figure 4-10. Save Menu

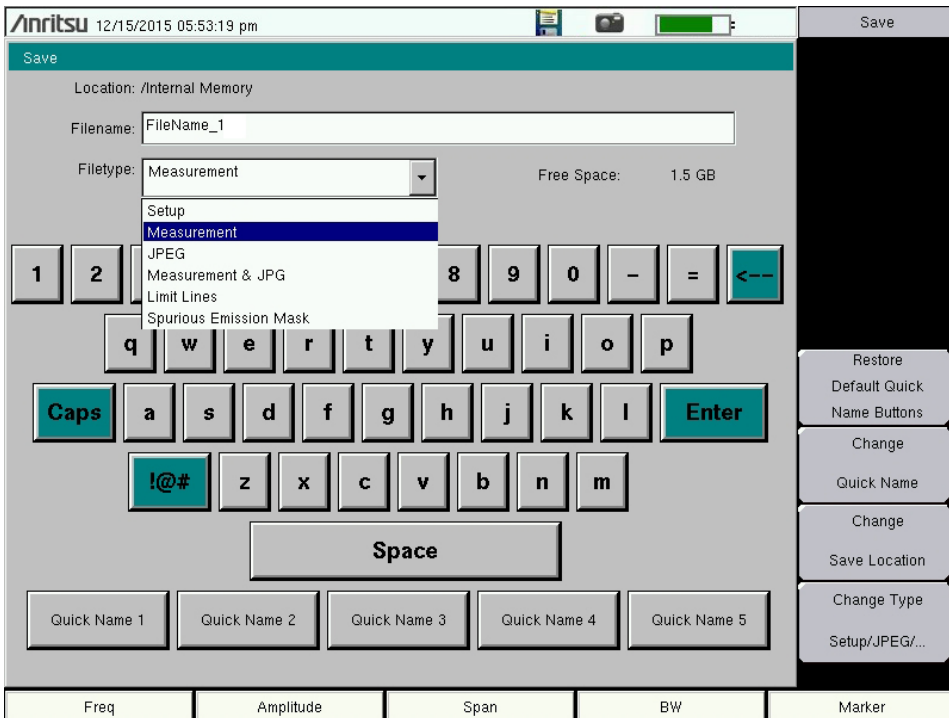


Figure 4-11. Save Dialog Box

File Type Menu

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

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

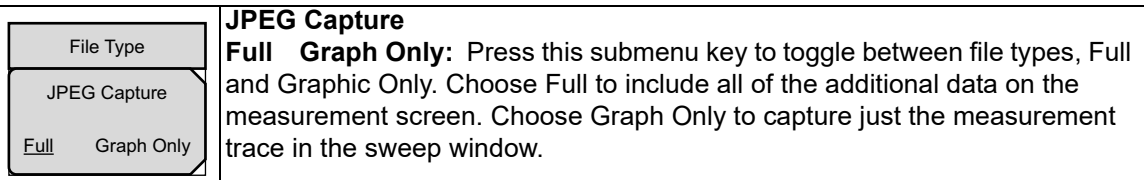


Figure 4-12. File Type Menu

Save Location Menu

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

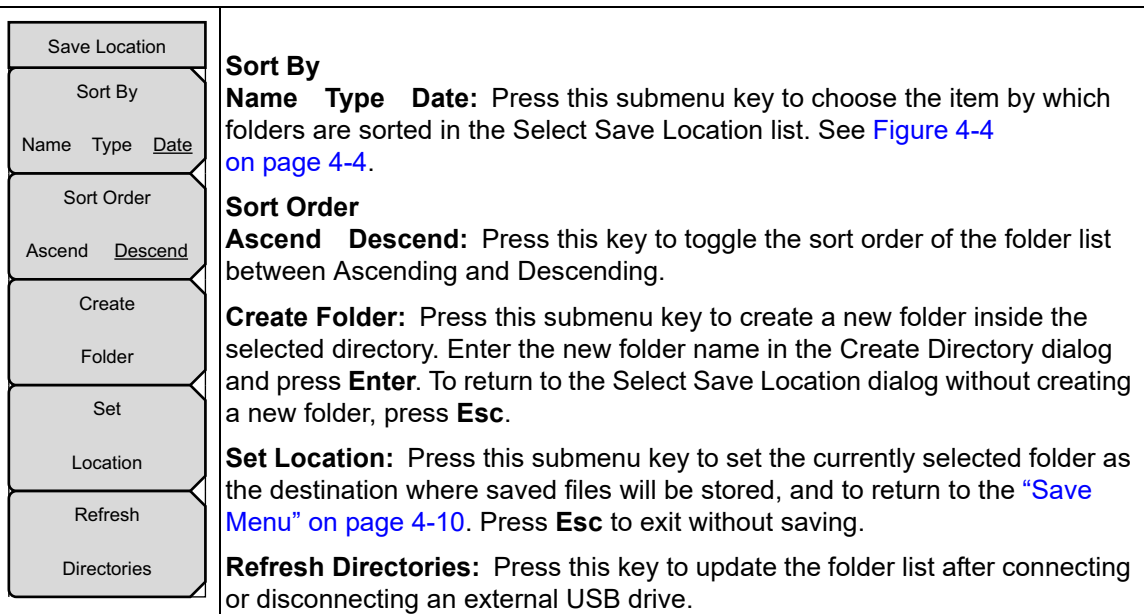


Figure 4-13. Save Location Menu

Save On... Menu

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

<p>The screenshot shows a vertical menu with the following items from top to bottom:</p> <ul style="list-style-type: none"> Save On... ...Crossing Limit (with On and Off sub-options) ...Sweep Complete (with On and Off sub-options) Save Then Stop (with On and Off sub-options) Clear All Back (with a left-pointing arrow) 	<p>In Spectrum Analyzer mode, this menu is used to automatically save measurements to the current save location after any of the following events:</p> <p>...Crossing Limit On Off: When this submenu key is set to On, measurement data is automatically saved when the trace crosses a limit line that has been specified with the Limit menu.</p> <p>...Sweep Complete On Off: When this key is set to On, measurement data is automatically saved after the current sweep is completed.</p> <p>Save Then Stop On Off: Set this key to On to stop the sweep after a measurement is saved. If this setting is Off and Sweep Complete is On, a measurement is saved after every sweep.</p> <p>Clear All: Press this key to turn Off all three Save On Event keys:</p> <ul style="list-style-type: none"> Crossing Limit Sweep Complete Save Then Stop <p>Back: Press this key to return to the “File Menu” on page 4-9.</p>
---	--

Figure 4-14. Save On Menu

Recall Menu

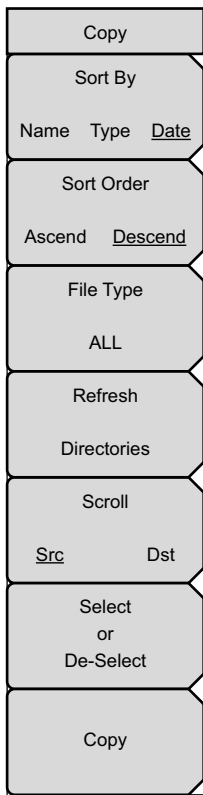
Key Sequence: **Shift > File (7) > Recall**

Recall	Use these menu keys to change the way files are listed in the Recall dialog box. Navigate to the desired file, then press Enter to recall.
Sort By Name Type <u>Date</u>	When recalling a saved setup, all current instrument settings are replaced by the stored setup information. When recalling a saved measurement and multiple traces are displayed, parameter settings shown on the instrument screen may reflect those of the recalled trace or the active trace, depending on the measurement mode or other factors.
Sort Order Ascend <u>Descend</u>	<p>Sort By Name Type Date: Press this submenu key to choose the item by which folders and files are sorted in the Recall dialog box. See Figure 4-5 on page 4-5.</p>
File Type Measurement	<p>Sort Order Ascend Descend: Press this key to toggle the sort order of the file list between Ascending and Descending.</p>
Refresh Directories	<p>File Type: Press this submenu key to open the Select File Type list box. Press the desired file type on the list, then press Enter to apply the selection. JPEG image files cannot be recalled and are not listed.</p> <p>Alternatively, you can select directly from the Filetype drop down list in the Recall dialog box.</p> <p>Refresh Directories: Press this key to update the file list after connecting or disconnecting an external USB drive.</p>

Figure 4-15. Recall Menu

Copy Menu

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



Sort By

Name Type Date: Press this submenu key to choose the item by which folders and files are sorted in the Copy dialog box. See [Figure 4-6 on page 4-6](#).

Sort Order

Ascend Descend: Press this key to toggle the sort order of the file list between Ascending and Descending.

File Type: Press this submenu key to open the Select File Type list box. Press the desired file type on the list, then press **Enter** to apply the selection.

Alternatively, you can select directly from the Filetype drop down list in the Copy dialog box.

Refresh Directories: Press this key to update the file list after connecting or disconnecting an external USB drive.

Scroll

Src Dst: Press this submenu key to shift navigation control between the source and destination panes in the Copy dialog box.

Select or De-Select: Press this key to select or deselect the current file or folder. Selected items are highlighted in blue.

Copy: Copies the selected files and folders, highlighted in blue in the top pane of the Copy dialog box, to the selected location in the bottom pane. If a file by the same name already exists in the destination location, an Error message is displayed, prompting you to press **Enter** to overwrite, or **Esc** to skip the conflicting file.

Figure 4-16. Copy Menu

Delete Menu

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

Delete	Sort By Name Type Date: Press this submenu key to choose the item by which folders and files are sorted in the Delete dialog box. See Figure 4-7 on page 4-7.
Sort By Name Type <u>Date</u>	Sort Order Ascend Descend: Press this key to toggle the sort order of the file list between Ascending and Descending.
Sort Order Ascend <u>Descend</u>	File Type: Press this submenu key to open the Select File Type list box. Press the desired file type on the list, then press Enter to apply the selection. Alternatively, you can select directly from the Filetype drop down list in the Delete dialog box.
File Type ALL	Select or De-Select: Press this key to select or deselect the current file or folder. Selected items are highlighted in blue.
Select or De-Select	Delete: Deletes the selected files or folders, which are highlighted in blue. In the confirmation box, press Yes to delete, No to cancel. You can also press Esc to cancel the deletion.
Delete	Refresh Directories: Press this key to update the file list after connecting or disconnecting an external USB drive.
Refresh Directories	

Figure 4-17. Delete Menu

Chapter 5 — System Operation

5-1 Introduction

This chapter reviews the Spectrum Master system operations and related menus. The other menus (Sweep, Measure, Trace, and Limit) are described in the Measurement Guides listed in [Appendix A](#).

5-2 System Menu Overview

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

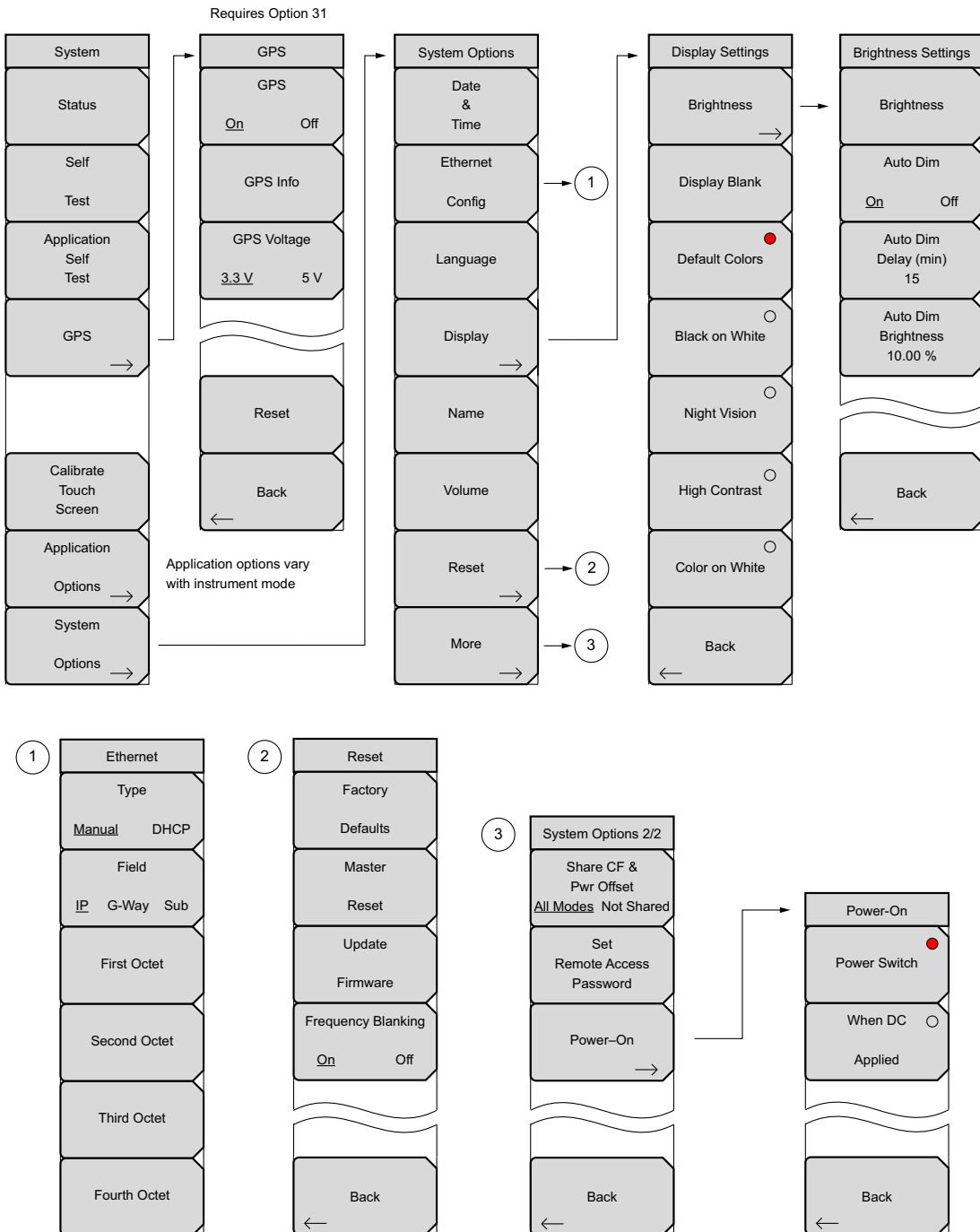


Figure 5-1. System Menu

5-3 System Menu

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

System	Status: Pressing this submenu key displays the current system status, including the operating system and firmware versions, temperatures and other details such as current battery information. Press Esc or Enter to return to normal operation.
Status	
Self	Self Test: This key initiates a series of diagnostic tests related to the performance of the motherboard hardware. A display will list the individual tests with a pass or fail indication. Press Esc or Enter to return to normal operation.
Test	
Application Self Test	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 and report the test results.
GPS →	Application Self Test: Press this submenu key to run a series of diagnostic tests related to the performance of the instrument hardware and that are specific to the current instrument mode (refer to “Mode Selector” 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.
Calibrate Touch Screen	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.
Application Options →	GPS: Opens the “GPS Menu” on page 6-4 .
System Options →	Calibrate Touch Screen: If the instrument does not respond as expected when you press the touch screen, press this key to display the touch screen calibration message box. Refer to “Touch Screen Calibration” on page 2-14 . The front panel shortcut equivalent of this submenu key is Shift, 0 (zero). Refer to “Calibrate Touch Screen Shortcut” on page 2-14 . Application Options: This submenu changes with the measurement mode. Refer to the appropriate Measurement Guide, as listed in Appendix A . System Options: Press this submenu key to open the “System Options Menu” on page 5-4 .

Figure 5-2. System Menu

System Options Menu

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

System Options	<p>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.</p>
Date & Time	
Ethernet Config	<p>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.</p>
Language	<p>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.</p>
Display →	<p>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.</p>
Name	<p>Caution: A firmware update or any instrument reset will overwrite modifications you may have made in any of the language files.</p>
Volume	<p>Display: The Display submenu key opens the “Display Settings Menu”, allowing brightness control and the selection of different display attributes.</p>
Reset →	<p>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.</p>
More →	<p>The assigned instrument name appears in measurement files, setup files, limit line files, and MST reports. It is displayed on the browser page banner when the instrument is connected to a remote PC or mobile device.</p> <p>Volume: Press this submenu key to view or adjust the speaker volume. The current volume setting is displayed in the Volume input box. Use the numeric keypad, the Up/Down arrow keys, or the rotary knob to change the value, and press Enter to apply the change.</p> <p>Reset: Press this submenu key to open the “Reset Menu” on page 5-9.</p> <p>More: Press this submenu key to open the “System Options 2/2 Menu” on page 5-5.</p>

Figure 5-3. System Options Menu (1 of 2)

System Options 2/2 Menu

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

<div style="border: 1px solid black; padding: 5px;">System Options 2/2</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Share CF & Pwr Offset <u>All Modes</u> Not Shared</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Set Remote Access Password</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Power-On →</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Back ←</div>	<p>Share CF & Pwr Offset</p> <p>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.</p> <p>Set Remote Access Password: Press this submenu key to open the Password entry dialog (see Figure 5-5 on page 5-6). 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.</p> <p>Setting the remote password and rebooting the instrument will lock it from Telnet and FTP connections. This means that 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. To unlock the instrument, remove the password by setting it to blank. The password is also removed following a Master Reset, Factory Defaults reset, or a firmware update.</p> <p>Power-On: Press this submenu key to open the “Power-On Menu” on page 5-6.</p> <p>Back: Press this submenu key to return to the “System Options Menu” on page 5-4.</p>
---	---

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

Warning

Do not set a remote access password when using SCPI commands to communicate with the instrument.

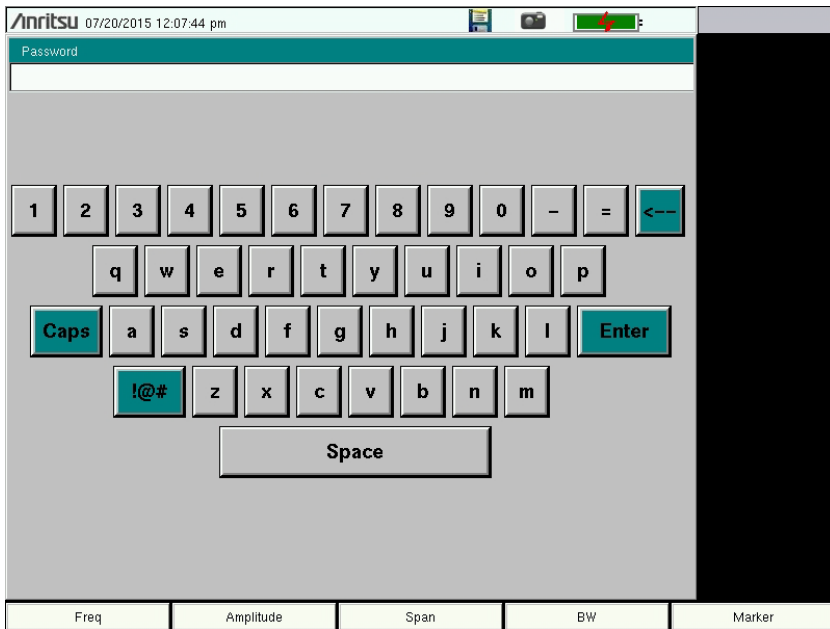


Figure 5-5. Remote Access Password Dialog

Power-On Menu

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

Power-On	
Power Switch <input checked="" type="radio"/>	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 <input type="radio"/> Applied	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 (see Figure 2-6 on page 2-6). Refer to “External Power On” on page 3-11 .
Back ←	Back: Press this submenu key to return to the “System Options 2/2 Menu” on page 5-5 .

Figure 5-6. Power-On Menu

Display Settings Menu

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

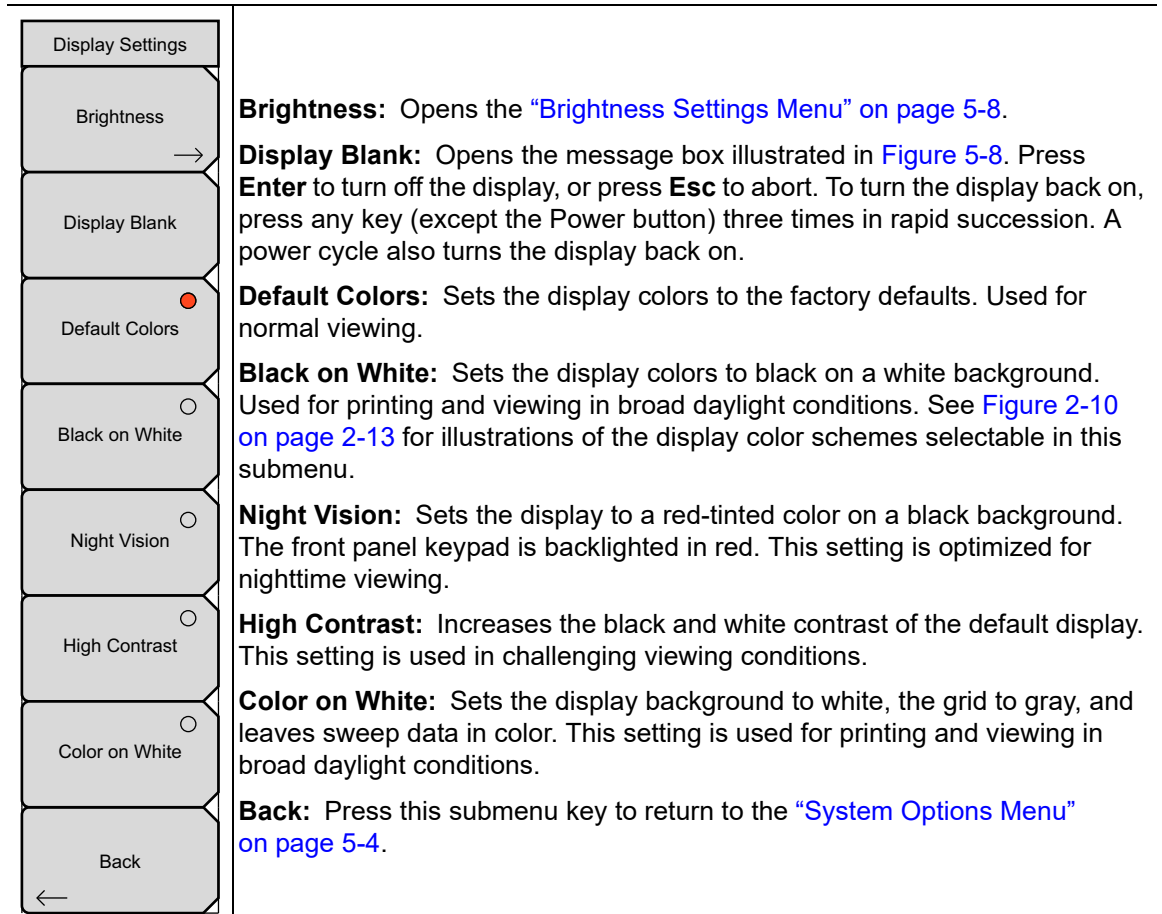


Figure 5-7. Display Settings Menu

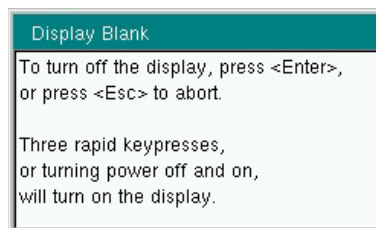


Figure 5-8. Display Blank Message Box

Brightness Settings Menu

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

Brightness Settings	The brightness of the display can be adjusted to optimize viewing under a wide variety of lighting conditions.
Brightness	Brightness: Press this submenu key to open the Brightness Editor window, where you can adjust the display brightness level from 0 to 100, with 100 being the brightest. See Figure 5-10 . Use the rotary knob to adjust the value in increments of 5, or press the Up/Down arrow keys to change the value in increments of 25. Press the Left or the Right arrow key to jump to 0 or 100, respectively. Press Enter to accept the change. All display elements on the instrument screen are affected by the Brightness setting.
Auto Dim On Off	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 (min) 15	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 10.00 %	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 ←	Back: Press this submenu key to return to the “Display Settings Menu” on page 5-7.

Figure 5-9. Brightness Settings Menu

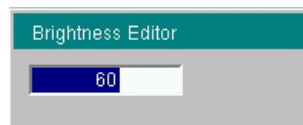


Figure 5-10. Brightness Editor Input Box

Reset Menu

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

<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Reset</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Factory Defaults</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Master Reset</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Update Firmware</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Frequency Blanking On Off</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px; text-align: center;">Back ←</div>	<p>Factory Defaults: Press this key to restore the instrument to the default settings for all measurement modes and system settings, including connectivity, language, and the display and audio settings. The instrument will power cycle when the operation is complete. Press the Enter key to initiate the reset, or press Esc to abort.</p> <p>Master Reset: Press this submenu key to restore the instrument to factory defaults as described above and to delete all user files from the instrument internal memory. The instrument will power cycle when the operation is complete. Press Enter to initiate the reset, or press Esc to abort.</p> <p>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.</p> <p>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.</p> <p>Note that saved measurements retain the frequency information, which may then be viewed on a PC, or recalled after frequency blanking is turned off.</p> <p>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).</p> <p>Back: Press this submenu key to return to the “System Options Menu” on page 5-4.</p>
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Figure 5-11. Reset Menu

5-4 Preset Menu

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

Preset	<p>Preset: This key resets all parameter settings for the current measurement mode to their factory default values, and switches the display to the default view for that mode. Measurement settings specific to other modes, or applications, are not affected.</p>
Preset	<p>Save Setup: Opens the Save dialog box (see Figure 4-1 on page 4-2) 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.</p>
Save Setup	<p>The saved setup can be named using the touch screen keyboard. Use the Caps key to select an uppercase letter. Use the Left/Right directional arrows to move the cursor position. Press Enter to save the setup.</p>
Recall Setup	<p>Note: Set the File type as Setup. Refer to “Save Menu” on page 4-10 for details.</p> <p>Recall Setup: This key allows the selection and recall of a previously stored instrument setup using the “Recall Menu” on page 4-13. Use the rotary knob, the Up/Down arrow keys, or the touch screen to highlight the saved setup, and press Enter. All current instrument settings are replaced by the stored setup information.</p>

Figure 5-12. Preset Menu

5-5 Self Test

At power on, the instrument 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 Spectrum Master hardware. The Application self test runs a series of tests related to the instrument hardware that is used in the current operating mode.

If the instrument is within the specified operating range with a charged battery and the self test fails, contact your Anritsu Service Center at: <http://www.anritsu.com/contact-us>.

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

1. Press the **Shift** key, followed by the **System** (8) key.
2. Press the **Self Test** submenu key. The Self Test results are displayed.
3. Press **Esc** to close the Self Test results dialog.

5-6 Updating the Spectrum Master Firmware

The Spectrum Master is updated using a USB memory device. Updated product information can be found on the Anritsu website:

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

1. Click the Downloads link, then click the Drivers/Firmware/Software tab.

Note	The “Firmware Revision History” link provides a summary of the firmware changes.
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2. After the download is complete, run the executable Windows file and follow the on-screen instructions. Press “Help (?)” for additional information.
3. After the firmware update is saved on a USB memory device, eject the memory device from the computer.
4. Turn the Spectrum Master off and insert the memory stick into the instrument.
5. Connect the AC adapter and turn on the Spectrum Master.
6. The instrument should prompt you to update the firmware. Press **Yes**, then select the desired “Save” mode from the presented choices, and then follow the instrument prompts. Press **No** if you do not wish to update the firmware.

Note	Do not turn off the instrument during the firmware update to avoid potential permanent damage.
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7. If the automatic update did not start, complete the following steps:
 - a. On the instrument, press the **Shift** key, then the **System** (8) key.
 - b. Press the following key sequence: System Options > Reset > Update Firmware. The Load Firmware menu opens.
 - c. Press the **Load Firmware** main menu key (located at the bottom left corner of the instrument screen).
 - d. Press the Update Application Firmware submenu key.
 - e. From the choices presented, select the desired “Save” mode.
 - f. Press the **Enter** key to begin the firmware update.
 - g. Press the **Enter** key one more time to confirm that you want to upgrade the instrument firmware.
8. After the update is complete, the instrument will restart.

Note	Do not turn off the instrument during the firmware update to avoid potential permanent damage.
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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. This option also enhances frequency reference oscillator accuracy in the spectrum analyzer mode. When GPS is actively locked to satellites, this information is saved with all saved measurements and can be displayed with Master Software Tools. No accuracy specifications apply if no GPS satellites are acquired.

Note

The Spectrum Master Technical Data Sheet provides a list of the options and measurements that require GPS (Option 31). In addition to having Option 31 installed, a GPS antenna is required. Refer to the instrument Technical Data Sheet for compatible GPS antennas.

6-2 Activating the GPS Feature

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

1. Press the **Shift** key, then the **System** (8) key on the numeric keypad to display the System menu.
2. Press the GPS submenu key.
3. 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.



Figure 6-1. GPS Icon, Red

4. When the GPS receiver is tracking at least four satellites, the GPS icon changes to green. Latitude and longitude information is displayed in the title bar at the top of the display. Acquiring satellites may take as long as three minutes.



Figure 6-2. GPS Icon, Green

5. Press the GPS Info submenu key to display the following information:

- Tracked satellites
- Latitude and longitude
- Altitude
- UTC timing information
- Fix available
- Almanac complete
- Antenna and receiver status
- GPS antenna voltage and current

Refer to [“GPS Menu” on page 6-4](#) for details on the above GPS Info items.

After GPS location fix is attained, 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 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 Resetting GPS

To reset the GPS, press the **Reset** submenu key. The green GPS icon shows a red cross mark when satellite tracking is lost after tracking four or more satellites. The GPS latitude and longitude are saved in the instrument memory until the Spectrum Master is turned off or until GPS is turned off by using the GPS On/Off key.



Figure 6-3. GPS Icon, Tracking Lost

6-4 Saving and Recalling Traces with GPS Information

Saving Traces with GPS Information

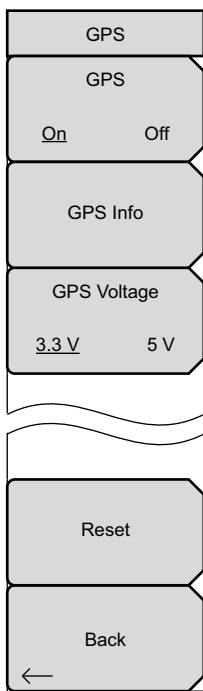
The GPS coordinates of a location can be saved along with a measurement trace. Refer to [“Save Menu” on page 4-10](#) for more information. The current GPS coordinates will be saved with the measurement traces whenever GPS is on and actively tracking satellites.

Recalling GPS Information

If the GPS coordinates were saved with a measurement, the coordinates will be recalled when the measurement is recalled. Refer to [“Recall Menu” on page 4-13](#) for more information on recalling a saved trace.

6-5 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 display the current GPS information.

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.

UTC: Universal Coordinated Time.

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 three satellites are found, the receiver will compute 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 has no 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: Active antenna is connected and is working properly.

Short/Open: If an active antenna is in use, a short or open exists between the antenna and the connection. If this message is displayed, replace the antenna. If the message persists, try another Anritsu GPS antenna. If needed, contact your nearest Anritsu Service Center. 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.

GPS Voltage: Press this submenu key to set the source voltage at 3.3 V or 5 V, depending on the GPS receiver being used. The default setting is 3.3 V to prevent accidental damage to lower-voltage GPS antennas.

Reset: The Reset key sets 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 submenu key to return to the [“System Menu” on page 5-3](#).

Figure 6-4. GPS Menu

Chapter 7 — Anritsu Tool Box

7-1 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. This chapter gives an overview of the software installation and the main features of each application in the Anritsu Tool Box.

The Tool Box may be downloaded and installed from the Anritsu website at:

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

7-2 Software Installation

Use Windows Explorer to find and launch the executable setup file, then follow the on-screen instructions. 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.

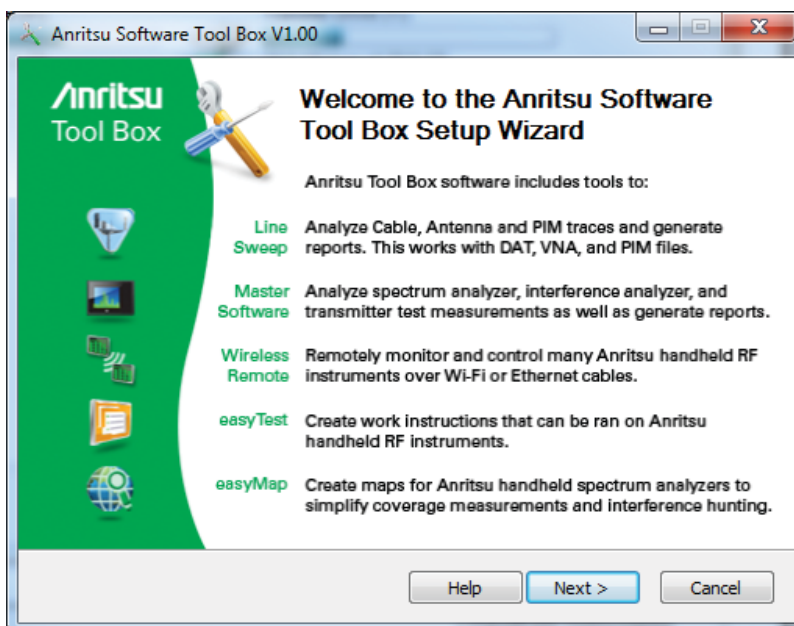


Figure 7-1. Anritsu Tool Box Setup Wizard

7-3 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 7-2](#).



Figure 7-2. Anritsu Tool Box Screen (may change with software version)

7-4 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 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 instructions 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 and fully configured for the measurement, including the measurement type, frequency and amplitude settings, and 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. 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 8 — Web Remote Control

8-1 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. Login passwords can be used to allow access to authorized users only.

A remote connection terminates when the user logs out or closes the browser, or when the session time requested at login expires. To prevent multi-user conflicts, only one connection is permitted at a time. A second user who tries to log in will see a message indicating the instrument is currently reserved by another client, with the time remaining in their session.

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

8-2 Setup

You can connect one or more instruments to any computer with HTML-5 compatible browser. Anritsu strongly recommends using Google Chrome, as other browsers do not fully support HTML-5. The control 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. Refer to [“Ethernet Menu” on page D-2](#). 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 the Google Chrome browser on your PC, laptop, or mobile device. Due to compatibility issues with HTML-5, do not connect using another browser than Chrome.

Enter the instrument IP address in the browser address bar to open the Web Remote Control Login page illustrated in [Figure 8-1 on page 8-3](#).

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 instrument. Refer to "[Ethernet Menu](#)" on [page D-2](#).
8. Launch the Google Chrome browser on your PC, laptop, or mobile device. Due to compatibility issues with HTML-5, do not connect using another browser than Chrome.
9. Enter the instrument IP address in the browser address bar to open the Web Remote Control Login page illustrated in [Figure 8-1 on page 8-3](#).

8-3 Web Remote Control Interface

The Web Remote Control Login page opens following browser connection to the instrument. See [Figure 8-1](#). The page may show or hide certain elements depending on device management options set by the Administrator, as described in “[Device Options](#)” on [page 8-11](#).

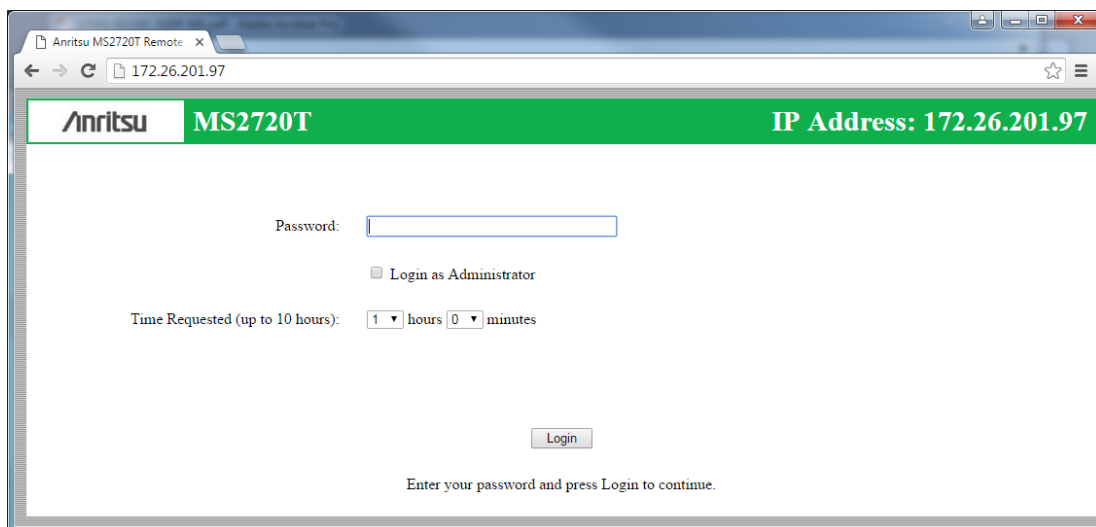


Figure 8-1. Login Page

User Login

To start a remote session with a test instrument:

1. Enter the instrument IP address in the Google Chrome address bar. The instrument must be connected via Ethernet as described in “[Setup](#)” on [page 8-1](#).
2. Use the pull-down menus on the Login page to set the time, in hours and minutes, before the remote session times out. The default session time is 1 hour, with a 10-hour maximum.

Only one user at a time can connect to the instrument. To avoid locking out other users unnecessarily, do not reserve a longer session than you need.

3. To enable functions available only to the network administrator, select the **Login as Administrator** checkbox.
4. Enter the instrument password, then click **Login**.

The default administrator password is “Admin” with a capital A. The default password for other users is None; that is, leave the field blank.

If another user already has control of the instrument when you try to log in, a message will display indicating the instrument is currently reserved by another client, whose IP address is listed with the time remaining in their session.

Following login, the Web Remote Control Home page is displayed.

Home Page

The Web Remote Control Home page lists the same information as what is displayed on the instrument screen when you press **Shift, System (8)** at the front panel, followed by the **Status** menu key.

At the top of the page, a green banner 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 banner.

The menu bar below the banner consists of tabs for commands and links: Home, Remote Control, Capture Screen, Capture Trace, File List, Device Management, and Logout.

The screenshot shows a web browser window titled "Anritsu MS2720T Remote" with the address bar showing "172.26.201.97". The page header features the Anritsu logo, the model number "MS2720T", and the IP address "IP Address: 172.26.201.97". Below the header is a navigation menu with tabs: Home, Remote Control, Capture Screen, Capture Trace, File List, Device Management, and Logout.

The main content area is divided into two sections: "System Information" and "Installed Components".

System Information

Versions		Operating Status	
Package	V1.12	Temperature	52.0 C / 125.6 F
OS	V3.69	Battery Charge	0 %
Base	V5.09	Battery Current	0 mA
ATA Boot	V3.25	Battery Voltage	11.3 V
Keypad	V2.3.4	Serial Number	1240901

Installed Components

Applications		Options	
Spectrum Analyzer	V6.47	9	Demod (FIFO)
Channel Scanner	V6.47	19	High Accuracy Power Meter
Interference Analyzer	V6.47	24	IQ Waveform Capture
AM-FM-PM Analyzer	V6.47	25	Interference Analyzer
PIM Analyzer	V6.47	27	Channel Scanner
WCDMA/HSDPA Signal Analyzer	V3.08	31	GPS
CDMA Signal Analyzer	V3.04	89	IF Bandwidth Output
GSM/GPRS/EDGE Signal Analyzer	V3.04	90	Gated Sweep
EVDO Signal Analyzer	V3.04	419	PIM Analyzer
High Accuracy Power Meter	V3.12	431	Coverage Mapping
Fixed WiMAX Signal Analyzer	V3.09	509	AM/FM/PM Analyzer (DEMODO)
Mobile WiMAX Signal Analyzer	V3.09	709	MS2720T 9 GHz
TD-SCDMA Signal Analyzer	V3.04	880	GSM/GPRS/EDGE
LTE Signal Analyzer	V3.13	881	WCDMA/HSPA+
TD-LTE Signal Analyzer	V3.08	882	TDSCDMA/HSPA+
		883	LTE (FDD/TDD)
		884	CDMA2000 1X/EVDO
		885	WIMAX (FIXED/MOBILE)

Figure 8-2. Web Remote Control Home Page

Remote Control

The Remote Control page displays 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 8-3](#).

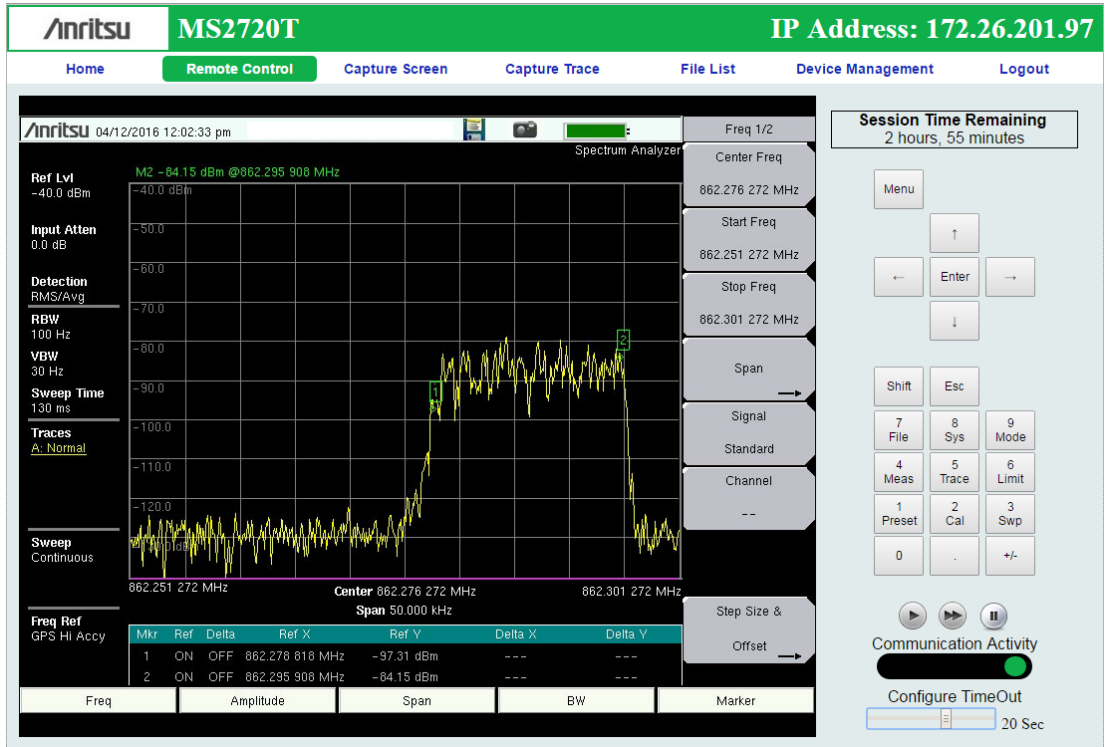


Figure 8-3. Remote Control Page

Notes

- When clicking a key or measurement icon on the Remote Control page, 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.

Session Time Remaining

This is the amount of time remaining before your remote session automatically terminates. The session time is reserved at login. It can be changed on the Device Management 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 near the bottom right of the page to return to Normal Mode from either Fast or Pause Mode. Clicking any tab on the menu bar also returns to Normal 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.

Configure Timeout

If the Ethernet connection is poor and you expect frequent lags in response time, you can increase the timeout up to 20 seconds, before the instrument sends an "Instrument Busy" message. The default timeout is 3 seconds.

Capture Screen

Captures a JPEG image of the current instrument display and saves it directly to internal memory. A file name is automatically created using the current date and time stamp. The captured display is loaded to the browser page, under the menu bar. See [Figure 8-4](#). In Windows, you can right-click on the screen image and select Copy. With iOS, press and hold on the picture. This makes it easy to create documentation using screen captures.

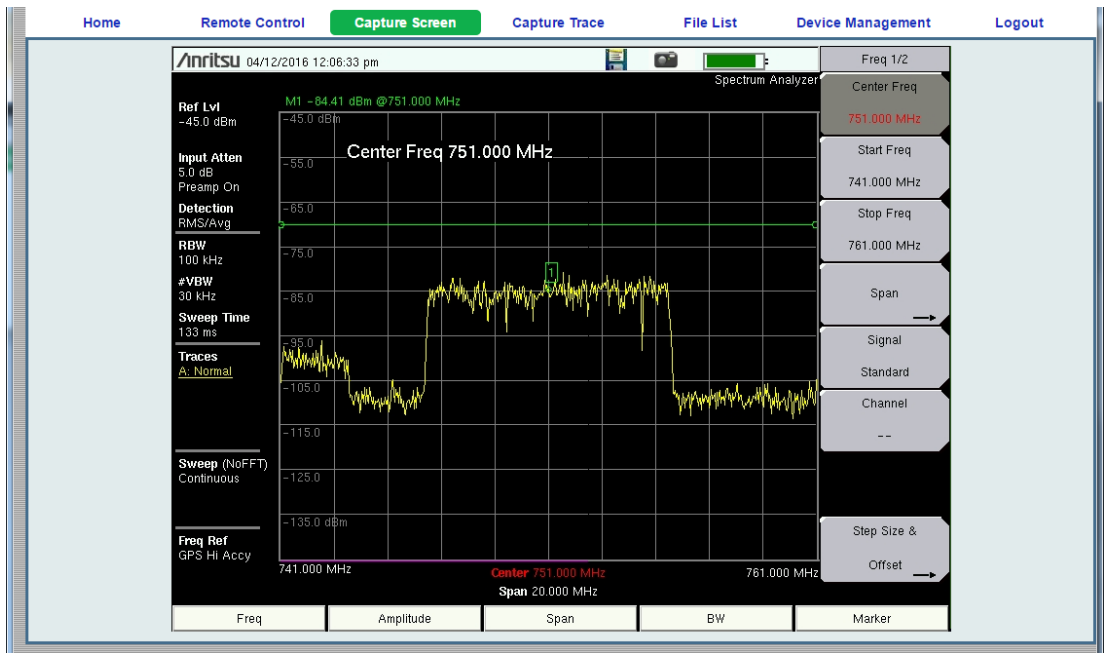


Figure 8-4. Capture Screen Page

Capture Trace

Opens an input dialog to enter a name for the trace to be saved. See [Figure 8-5](#). After clicking Save, a confirmation dialog opens to indicate the trace was successfully saved to the instrument.

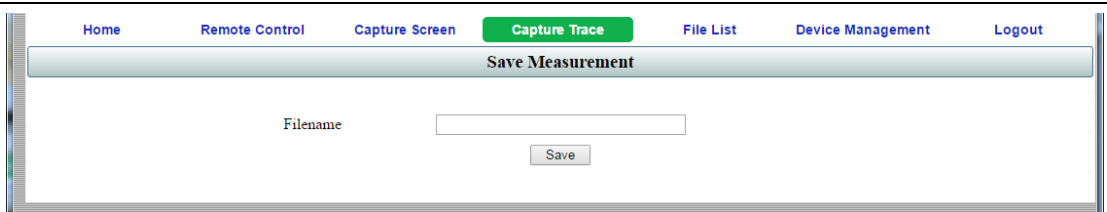


Figure 8-5. Capture Trace Page

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 (type “dir”) and files contained in the instrument's internal memory. See [Figure 8-6](#). To view the contents of a folder, click on the folder name.

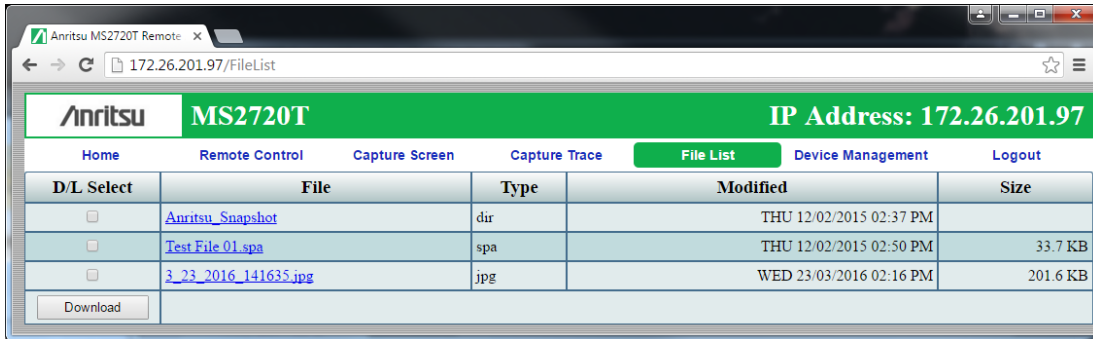


Figure 8-6. File List Page

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, like iOS, do not support file downloads.

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 (not as Administrator)

Click the **Device Management** tab on the menu bar to set or clear the instrument password, to assign a device name to the instrument, or to change the session time. See [Figure 8-7](#).

If you logged in as Administrator, the **Device Management** page has additional sections for viewing the remote access log and for setting device options. Refer to [“Device Management \(Administrator\)” on page 8-10](#).

Password

If no password is set, which is the factory default, remote access to the instrument is unrestricted and any user who knows the instrument IP address can connect to it, provided the device isn't currently reserved by another client. When a password is set, it is required upon login. To clear the current password, click the **Reset** button. This password is different from the administrator password described under [“Device Management \(Administrator\)”](#).

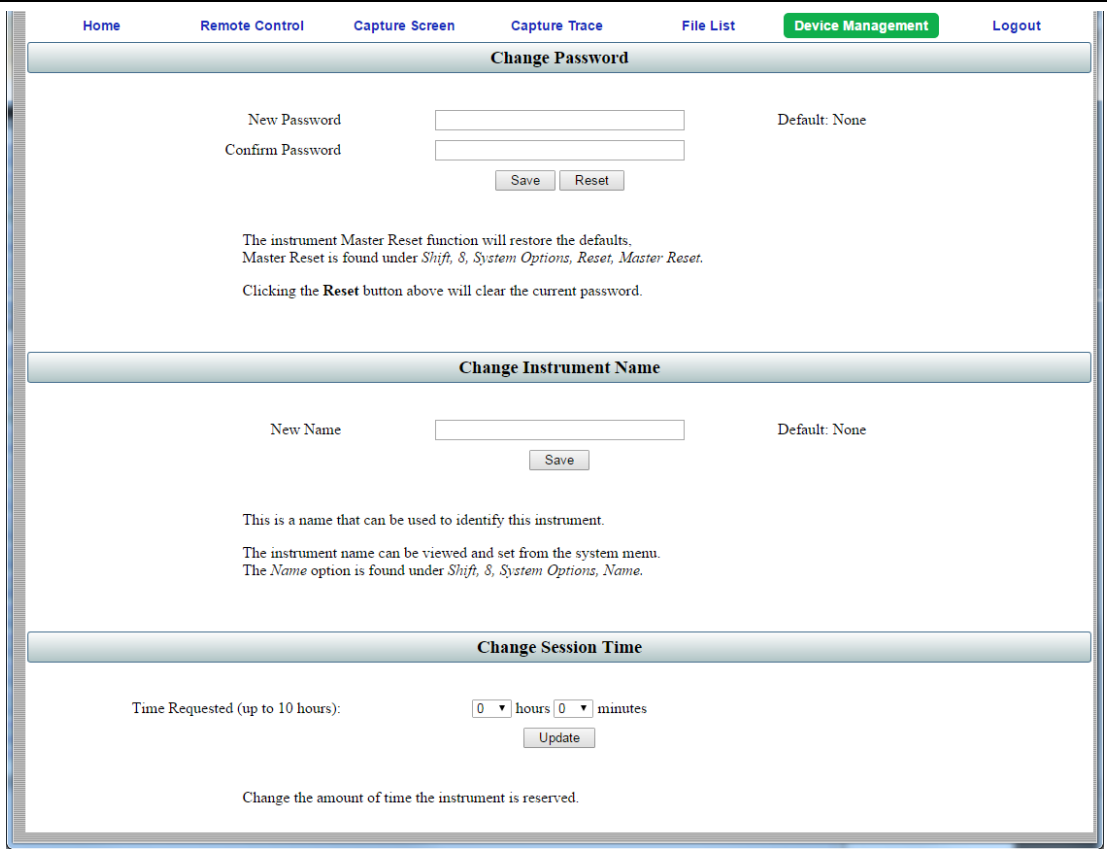


Figure 8-7. Device Management Page

Instrument Name

The instrument name, if defined, is displayed in the green banner at the top of the page. 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.

Session Time

Use the pull-down menus to select the time, in hours and minutes, before the remote session times out. Click **Update** to reset the session timer at the specified duration. At the end of the selected time period, a message notifying the user that the session has expired will display.

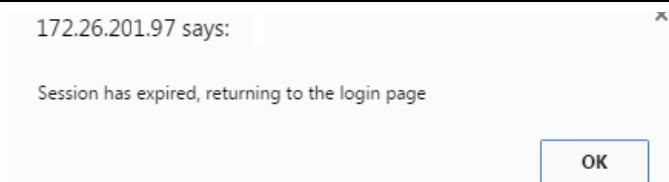


Figure 8-8. Session Expired

Device Management (Administrator)

Logging in as Administrator gives you access to additional functions associated with the instrument's remote connection log and the display of information on the Login page.

Home
Remote Control
Capture Screen
Capture Trace
File List
Device Management
Logout

Change Password

New Password

Confirm Password

Default: Admin

The instrument Firmware Update will restore the default password.
 Clicking the **Reset** button above will reset the password to default.

Access Log

2016 Apr 01, 01:35 PM	Admin	Fail	172.26.202.96
2016 Apr 01, 01:37 PM	Admin	Success	172.26.202.246
2016 Apr 01, 01:39 PM	Admin	Success	172.26.202.96
2016 Apr 01, 01:41 PM	User	Success	172.26.202.96
2016 Apr 01, 01:44 PM	User	Success	172.26.202.96
2016 Apr 01, 01:45 PM	Admin	Success	172.26.202.96

Device Options

Show device banner on Login page

Disclaimer Text

Default: None

Change Instrument Name

New Name

Default: None

This is a name that can be used to identify this instrument.
 The instrument name can be viewed and set from the system menu.
 The *Name* option is found under *Shift, S, System Options, Name*.

Change Session Time

Time Requested (up to 10 hours): hours minutes

Change the amount of time the instrument is reserved.

Figure 8-9. Device Management Page (Administrator)

Administrator Password

A password is always required to log in as Administrator. The password is case-sensitive, with “Admin” as the factory default. To change the password, type your new entry twice and click Save. See [Figure 8-9 on page 8-10](#).

To restore the default password, click the **Reset** button. The administrator password is also reset to default each time you update the instrument firmware.

Access Log

The Access Log is viewable only when you are logged in as Administrator. It contains the date and time, success or failure status, and user information for up to 50 most recent login attempts. To save a copy of the log to the default download location on your control device, click **Download Log**. The saved file is a comma-delimited CSV file that can be opened with an application like Microsoft Excel. Click the **Clear Log** button to empty the Access Log.

Note	Some operating systems, such as iOS, do not support a user-accessible file system. Consequently, the download function is not possible if your control device is an Apple iPhone, for example.
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Device Options

When logged in as Administrator, you have the option to turn on or off the optional text message and the green banner on the Login page.

For security reasons, for example, you may not want the instrument IP address to display during login. To hide the banner, deselect the **Show device banner** on Login page checkbox. See [Figure 8-9 on page 8-10](#). After changing the Show/Hide setting, click **OK** in the Banner Visibility message box. You may need to scroll the browser page to bring the message box into view.

The factory default is to show the banner. Note that this device option only affects the Login page. [Figure 8-10](#) illustrates the Login page with no banner.

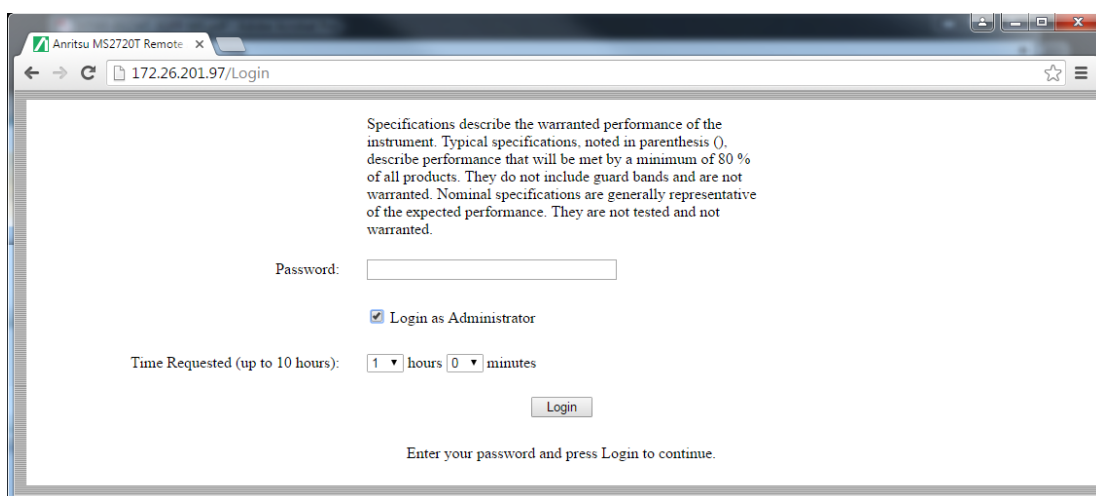


Figure 8-10. Login Page with Optional Text and No Banner

To add a disclaimer or any other message to the Login page, enter the appropriate text in the text box under the Device Options section of the Device Management page, then click **Save**. See [Figure 8-9 on page 8-10](#). Click **OK** in the update status message box ([Figure 8-11](#)). You may need to scroll the browser page to bring this message box into view.

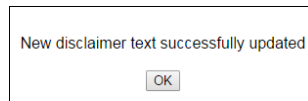


Figure 8-11. Disclaimer Text Update Status

[Figure 8-10 on page 8-11](#) shows an example of optional text on the Login page. To remove the message, delete it from the Disclaimer Text box on the Device Management page and click **Save**, then **OK**.

Instrument Name

The instrument name function is the same whether you are logged in as Administrator or as a regular user. Refer to [“Instrument Name” on page 8-9](#).

Session Time

The session time is set in the same manner, whether you are logged in as Administrator or as a regular user. Refer to [“Session Time” on page 8-9](#).

Logout

Exits Web Remote Control and displays the Login page. To start a new session, enter the password if required, then select the session time and click **Login**.

Note	If you close the Web Remote Control browser window without logging out, there may be a slight delay before the instrument is released. During this time, connection attempts by other users will fail.
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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 from the Anritsu Web site. To determine the spectrum analyzer firmware version in your instrument, refer to submenu key description for “[Status](#)” on page 5-3.

Options

Table A-1. Analyzers and Analyzer Options (1 of 2)

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) PIM Hunting 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)
CDMA/EV-DO Measurements (884)	3GPP2 Signal Analyzer Measurement Guide (10580-00235)

Table A-1. Analyzers and Analyzer Options (2 of 2)

Spectrum Master Feature (Required Option)	Related Document (Part Number)
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) LTE 256 QAM Demodulation Measurement (886) NB-IoT Analyzer (887)	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
EMF Measurement Guide (Option 444)	10580-00455

A complete suite of PC Tools for Anritsu Handheld RF Instruments is available for download:

anritsu.com/en-US/test-measurement/support/technical-support/handheld-tools-tool-box

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.

B-2 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 instrument is turned off. These parameters can be erased, however, via a Master Reset operation, as described in [“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 **On** is underlined. Setting Frequency Blanking back to **Off** 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.

- 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.

B-3 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.

B-4 Spectrum Master Memory Types

The instrument contains non-volatile disk-on-a-chip memory, EEPROM, and volatile DRAM memory. The instrument does not have a hard disk drive or any other type of volatile or non-volatile memory.

Disk-On-A-Chip (DOC): DOC is used for storage of instrument firmware, factory calibration information, user measurements, setups, and .jpg screen images. User information stored on the DOC is erased by the master reset process described below.

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 stored in the EEPROM are set to standard factory default values.

RAM Memory: This is volatile memory used to store parameters 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. The user can also copy the contents of the internal disk-on-chip 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 [Chapter 4, “File Management”](#) for additional information on saving and copying files to the USB flash drive.

B-5 Erase All User Files in Internal Memory

Perform a Master Reset:

1. Turn the instrument on.
2. Press the **Shift** button, then the **System** (8) button.
3. Press the System Options submenu key.
4. Press the Reset key, then the Master Reset key.

A message box will be displayed to warn the user that all settings will be returned to factory default values and all user files will be deleted. This is a standard file deletion and does not involve overwriting existing information.

5. Press the **ENTER** button to complete the master reset.
6. The instrument will reboot and the reset is complete.

B-6 Recommended Usage in a Secure Environment

Set the instrument to save files to the external USB Flash drive:

1. Attach the external Flash drive and turn the instrument on.
2. Press the **Shift** button, then the **File** (7) button.
3. Press the Save submenu key.
4. Press the Change Save Location submenu key, then select the USB drive with the rotary knob, **Up/Down** arrow keys, or the touch screen.
5. Press the Set Location submenu key.

The external USB drive is now 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. 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.

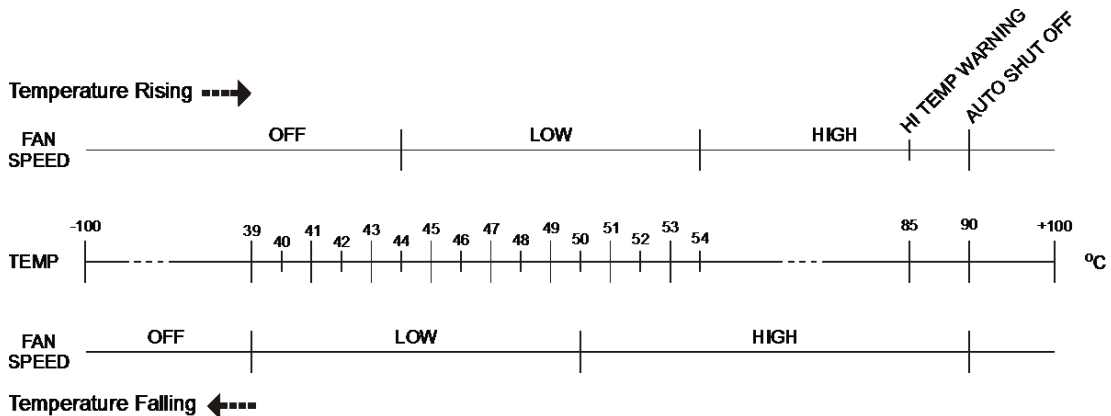


Figure C-1. Fan Speed versus Temperature

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 Spectrum Master.

D-2 LAN Connection

The RJ-45 connector is used to connect the instrument 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.

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**

Ethernet	Type
Type Manual DHCP	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 .
Field IP G-Way Sub	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.
First Octet	If DHCP is selected with the Type key, press Enter to close the Ethernet Editor dialog, then press Shift, System , and Status to view the IP address assigned by the DHCP server. Press Esc to close the Status screen.
Second Octet	Field
Third Octet	IP G-Way Sub: Press this submenu key to select the desired Internet Protocol Property to be edited.
Fourth Octet	First Octet: Moves the cursor to the leftmost column of the selected IP properties field.
	Second Octet: Moves the cursor to the second column from the left of the selected IP properties field.
	Third Octet: Moves the cursor to the third column from the left of the selected IP properties field.
	Fourth Octet: Moves the cursor to the fourth column from the left of the selected IP properties field.

Figure D-1. Ethernet Menu

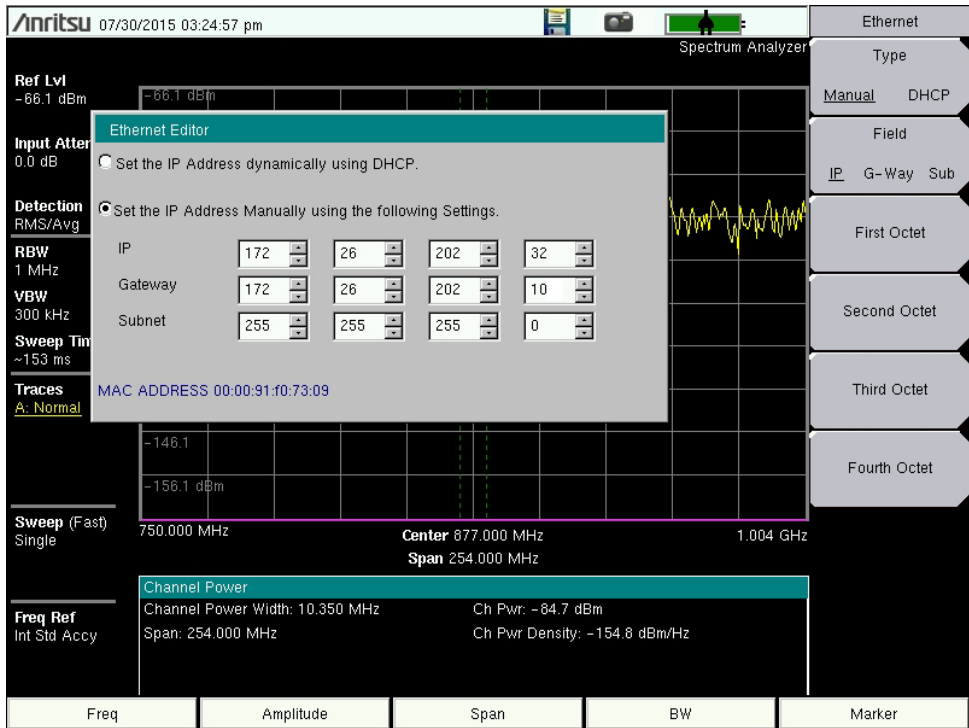


Figure D-2. Setting IP Address Manually

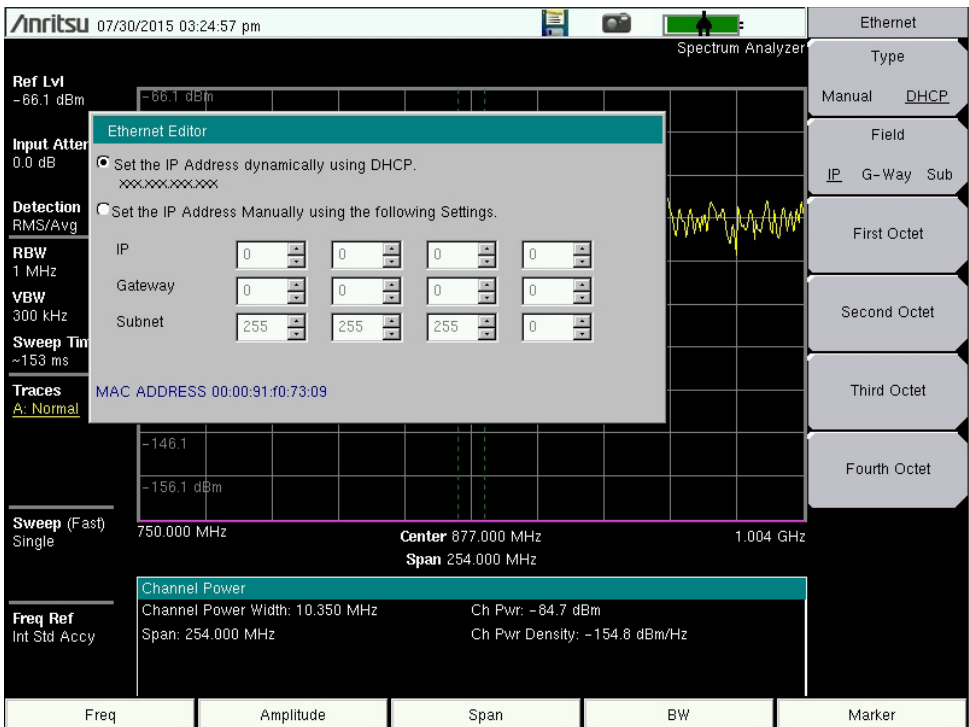


Figure D-3. IP Address Assigned Using DHCP

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 discrete 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 10^7 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. It 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. The 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. $F = 10 \log(F)$ where log uses the base 10, or common log. This formula is valid only when 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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N



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Anritsu Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA

<http://www.anritsu.com>