User Guide

PIM Master™ Passive Intermodulation Analyzer with Site Master™ Cable & Antenna Analyzer (331) and 2-Port Options (703)

MW82119B

Anritsu

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Chapter 1 — General Information

1-1   Introduction

The PIM Master MW82119B User Guide is one of the set of manuals that cover all of the instrument's functions and uses. The PIM Master with Site Master and 2-port LTE 700 MHz (option 703) options is capable of performing a wide variety of Passive Intermodulation (PIM) and Line Sweep measurements. This guide provides a quick-start section with a brief overview of the available PIM, Line Sweep, and 2-port measurements. Please refer to the measurement guides listed in Table 1-1, "Related Documentation" for more detailed measurement instructions. This guide also provides a summary of the hardware and software features of the PIM Master that are common to all measurement modes.

Note	Throughout this user guide, screen images are provided as examples. The image and measurement details on your instrument may differ from the examples in this user guide.

Related Documentation

Document Part Number	Description (Required Option)
10100-00065	Important Product Information, Compliance, and Safety Notices
10580-00240	Power Meter Measurement Guide High-Accuracy Power Meter (Option 19)
10580-00241	Cable and Antenna Analyzer Measurement Guide Cable and Antenna Analyzer (Option 331)
11410-00824	PIM Master Product Brochure
11410-00821	PIM Master Technical Data Sheet Performance Specifications
10580-00402	Passive Intermodulation Analyzer Measurement Guide
10580-00403	PIM Master MW82119B Programming Manual
10580-00401	PIM Master MW82119B Maintenance Manual
11410-00784	Configuring the Anritsu PIM Master for Wireless Browser Control
10580-00252	Site Master User Guide

Table 1-1.   Related Documentation

Note	PIM is a measure of system linearity as compared to line sweeping, which is a measure of system impedance. Both tests are critical to validate a cellular system.

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/mw82119B

Document Conventions

Main menus and keypad buttons are shown in the user guide using a **Serif Bold** typeface. Main menus are the buttons displayed at the bottom of the touchscreen. Submenus and submenu buttons are displayed on the right side of the touchscreen display and shown in the user guide using Serif Regular typeface.

Menu and button locations may be described in this document by their path:

   Measurement > VSWR

The line above reads as "Press the Measurement main menu, then press the VSWR button."

Contacting Anritsu for Sales and Service

To contact Anritsu, please visit:

http://www.anritsu.com/contact-us

Here, you can find sales, customer service, and support contact information for your country or region, provide online feedback, complete a "Talk to Anritsu" form to have your questions answered, or obtain other services offered by Anritsu.

Updated product information can be found on the Anritsu web site:

http://www.anritsu.com/

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

Example URL for MW82119B:

http://www.anritsu.com/en-US/test-measurement/products/mw82119b

1-2   Instrument Description

Anritsu developed the PIM Master, with Site Master and 2-Port LTE options, to fully characterize the RF performance of transmission systems with a single test instrument. Previously, two separate analyzers were required to measure Passive Intermodulation (PIM) and impedance mismatches in RF transmission lines. With Site Master Option 331 installed, the PIM Master can now perform both tests to ensure minimum signal degradation, minimum noise generation, and maximum signal throughput. Capabilities with Option 331 installed include:

- PIM vs. TIME
- Swept PIM
- Noise Floor
- Distance-to-PIM
- Return Loss
- VSWR
- Cable Loss
- Distance-to-Fault (DTF)

PIM Master Options

Table 1-2 lists the current available options. Refer to the Anritsu web site for the latest information on available PIM Master options and frequency ranges.

Table 1-2.   PIM Master Options

Instrument Option	Description
MW82119B-0600	LTE 600 MHz with 1900 MHz
MW82119B-0700	LTE 700 MHz
MW82119B-0701	APT 700 MHz
MW82119B-0703	2-Port LTE 700MHz
MW82119B-0800	LTE 800 MHz
MW82119B-0850	Cellular 850 MHz
MW82119B-0900	E-GSM 900 MHz
MW82119B-0902	E-GSM 900 MHz with IM2
MW82119B-0180	DCS 1800 MHz
MW82119B-0194	PCS/AWS 1900/2100 MHz
MW82119B-0210	UMTS 2100 MHz
MW82119B-0260	LTE 2600 MHz
MW82119B-0331	Site Master Cable and Antenna Analyzer
MW82119B-0031	GPS Receiver (requires antenna)
MW82119B-0019	High Accuracy Power Meter (requires sensor)
MW82119B-0098	Standard Calibration Certification
MW82119B-0099	Premium Calibration Certification

Note	For ordering information and for option and accessory part numbers, refer to the technical data sheet (listed in Appendix A).

1-3   Instrument Care and Preventive Maintenance

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

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

Connector Care

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

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

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

Connecting Procedure

1. Carefully align the connectors.

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

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

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. When 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.

Test Cable from PIM Master to DUT

Remove O-rings from the test cable and be sure that the connectors are clean. If the DUT connector has an O-ring, then use a torque wrench to tighten the connector.

Note	When testing, cables are connected and disconnected many times. In order to save wear on these test cables and RF adapters, Anritsu recommends removing the O-rings. This allows getting a sufficiently tight connection without unnecessary stress on the connectors. In the field, O-rings are important to maintain connection integrity over long time periods. Connections must be torqued to specifications in order to ensure that they prevent water intrusion.
	During your test, if the DUT connector has an o-ring, leave it in place and tighten to the correct torque.

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.

Connector Saver

Anritsu recommends using an adapter on the intrument's 7/16 DIN female RF Out connector to act as a connector saver. Typically, the instrument's connector has a useful life of 500 matings. A 7/16 DIN(f) to 7/16 DIN(m) and 50 Ω connector saver reduces wear on the connector, and may stay on the instrument while it is in the soft case or transit case. One connector saver is provided with your test instrument.

The recommended torque for attaching the connector saver to the instrument is 25 N · m (~18 lbf · ft). Use a torque wrench to make the connection.

Replacement connector savers can be purchased from Anritsu. The part number is in your Technical Data Sheet.

ESD Caution

The PIM 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 PIM Master without first discharging the static charge) may damage the PIM Master input circuitry.

Caution	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 PIM Master, Anritsu recommends that any static charges that may be present be dissipated before connecting coaxial cables or antennas to the PIM Master. This may be as simple as temporarily attaching a short or load device to the cable or antenna prior to attaching to the PIM Master. It is important to remember that the operator may also carry a static charge. Following the practices outlined in the referenced standards will ensure a safe environment for both personnel and equipment.

Battery Information

The batteries that are supplied with the PIM Master may need charging before use. They can be charged using either the AC-DC Adapter or the DC adapter. The batteries can also be charged by using an external charger (refer to your Technical Data Sheet). Refer to Section E-3 "Battery Care" on page E-2.

Note	Use only Anritsu Company approved batteries, adapters, and chargers with this instrument. The batteries charge at a faster rate when the instrument is turned off. Charging the batteries while the instrument is running requires a longer time to reach a full charge. To prolong the useful battery life, the internal charging circuit monitors the battery temperature. Normal charging occurs when the battery temperature is between 0 °C and 45 °C. Charging is paused if the internal battery temperature is beyond this range. Anritsu Company recommends removing the battery for long-term storage of the instrument.

Caution	When using the Automotive Cigarette Lighter Adapter, always verify that the supply is rated for a minimum of 40 Watts at 12 VDC, and that the socket is clear of any dirt or debris. If the adapter plug becomes hot to the touch during operation, then discontinue use immediately.

The PIM Master batteries can be replaced without the use of tools. The battery compartment access is on the bottom of the PIM Master. Refer to Section E-4 "Battery Replacement" on page E-3.

PIM Master Firmware Update

Refer to Section E-5 "PIM Master Firmware Update" on page E-6 for firmware upgrade procedures.

1-4   Calibration Requirements

Field-calibrate your PIM Master as required to achieve acceptable residual PIM. The instrument provides calibration prompts to help you determine calibration status. Anritsu recommends annual factory calibration and performance verification by local Anritsu service centers. The Cable and Antenna Analyzer mode requires calibration standards for OPEN, SHORT, and LOAD (OSL), which are sold separately.

Note	Anritsu recommends allowing the instrument to warm up to typical operation temperature (approximately 15 minutes) before calibrating.

1-5   Wireless Remote Control

Browser-based control allows you to remotely control the PIM Master from any Wi-Fi enabled device with web browser software (Chrome or Firefox preferred). This includes a wide range of tablets and phones running Android or iOS operating systems as well as the traditional Linux and Windows laptop and desktop computers.

Wi-Fi links are useful in the field, particularly when the PIM Master is on a tower, and you are on the ground.

For wireless remote control, a Wi-Fi router must be connected to the PIM Master.

Refer to Appendix C, "Wireless Remote Control" for more details on using this capability to enable wireless control.

Chapter 2 — PIM Master Overview

2-1 Introduction

This chapter describes the MW82119B PIM Master. It also includes a brief description of preventive maintenance, calibration requirements, and additional PIM Master documents.

Warning	The Anritsu PIM Master is capable of producing 80 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields: Always terminate the PIM output port of the test equipment into a load, a loaded line, or a line that will radiate or absorb the energy before beginning a PIM test. Confirm that the PIM Master RF power is off after a PIM test. Always confirm that the PIM RF power is off before disconnecting a coaxial connection, otherwise RF burns may result. Immediate burns to fingers or eyes can result from exposure to live connectors. Ensure that all antennas under test are placed so that no personnel are exposed to RF levels that exceed the maximum allowable exposure.

2-2 Turning On the PIM Master for the First Time

The Anritsu MW82119B PIM Master is capable of more than 3.0 hours of continuous operation from a fully charged, field-replaceable battery (refer to Section E-4 "Battery Replacement" on page E-3). The PIM Master can also be operated from a 12 VDC source (which will also simultaneously charge the battery). This can be achieved with either the Anritsu AC Adapter or Automotive 12 Volt Adapter. Both items are included as standard accessories (refer to the list of accessories in the Technical Data Sheet for your specific instrument, as listed in Appendix A).

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

To turn on the MW82119B PIM Master, press the **On/Off** button on the front panel (Figure 2-3 on page 2-4). The PIM Master takes approximately 40 seconds to complete power-up and to load the application software. At the completion of this process, the instrument is ready to be used.
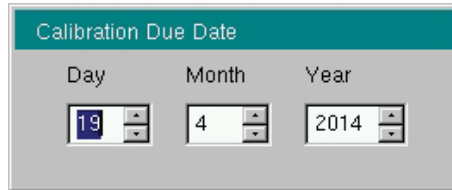
Note	Anritsu recommends that you turn on your PIM Master and let it warm up for 10 minutes before performing your first calibration.

Calibration Due Date

On first use, or if the Calibration Reminder setting is greater than the due date, a menu is displayed requesting that you enter the Calibration Due Date for this instrument. This date is available on the calibration sticker that is provided with the instrument. Enter the correct day, month, and year and then press **Enter**.

Figure 2-1.   Calibration Due Date Dialog Box

The initial calibration due date is set to one year from the Factory Calibration Date, unless you enter a different date.

Calibration Reminder

You can set a reminder of the due date by pressing the Days Before Calibration Reminder submenu key and entering a number with the number keypad. Complete the entry by pressing the Enter submenu key or the instrument **Enter** key.
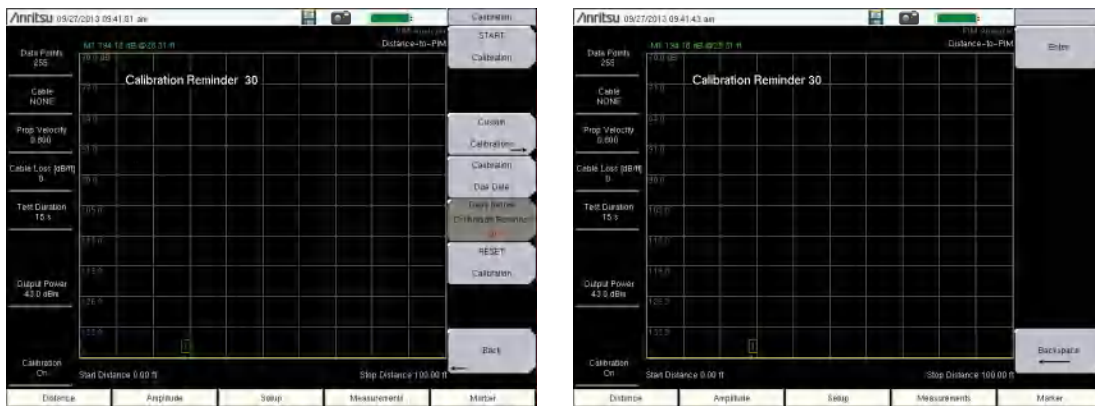
Figure 2-2.   Days Before Calibration Reminder

2-3   Front Panel Overview

The PIM Master menu-driven interface is easy to use and requires little training. The PIM Master uses a touch screen and keypad for data input. The five bottom menu keys and eight submenu keys on the right side are touch screen keys. The menu and submenu keys will vary depending upon the selected mode of operation, refer to "Mode Selector Menu" on page 2-20.

Number keys 1 through 9 are dual purpose, depending upon the current mode of operation. The dual-purpose keys are labeled with a number on the key itself with the alternate function printed in blue above each of the keys. Use the blue **Shift** key to access the functions printed on the panel. The **Escape** key, used for aborting data entry, is the button located above number key 8. The four **Arrow** keys and the keypad can be used to change the value of an active parameter.

MW82119B PIM Master Front Panel
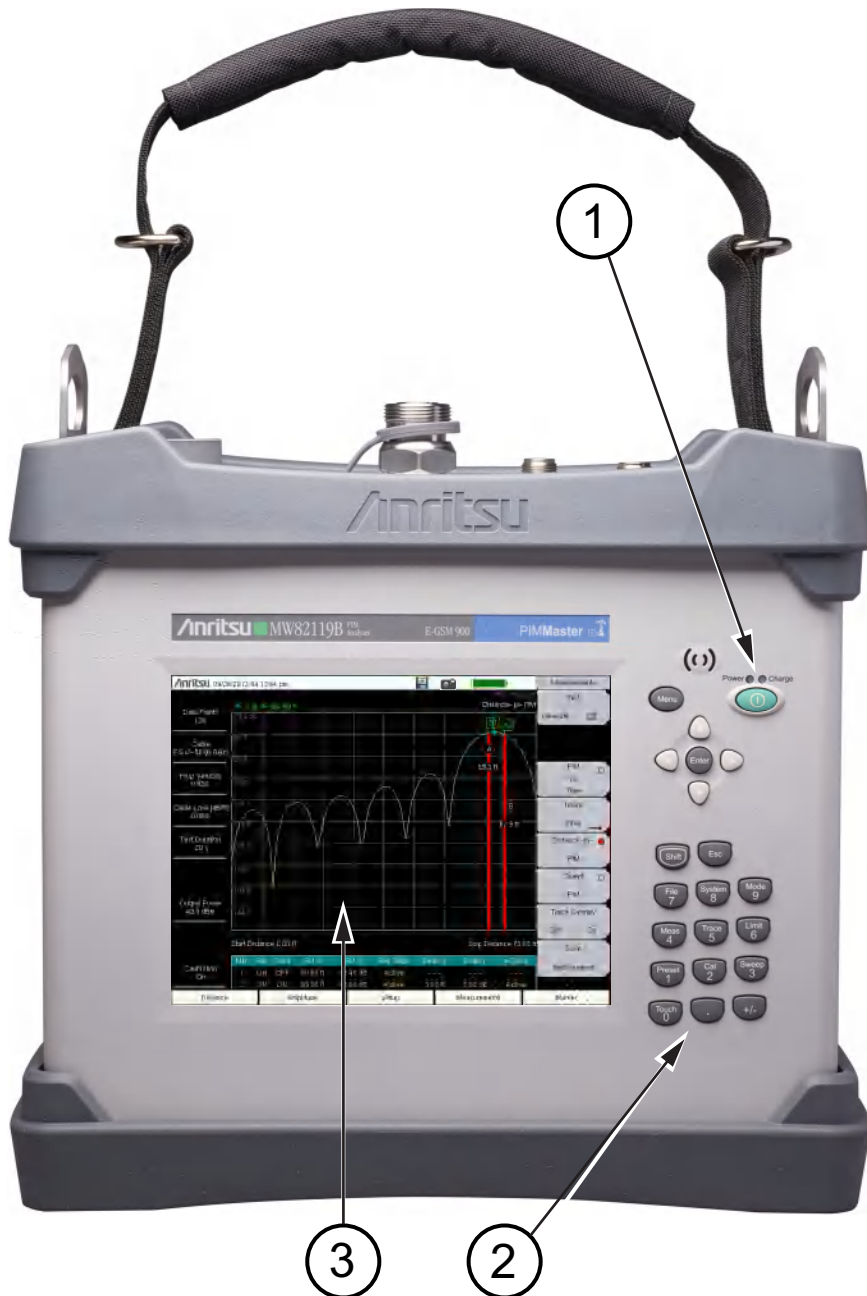
Figure 2-3.   MW82119B PIM Master Front Panel

1.	On/Off Button (and Battery and Power LEDs)
2.	Number Keypad
3.	Measurement Display (a Touch Screen)

2-4   Front Panel Keys
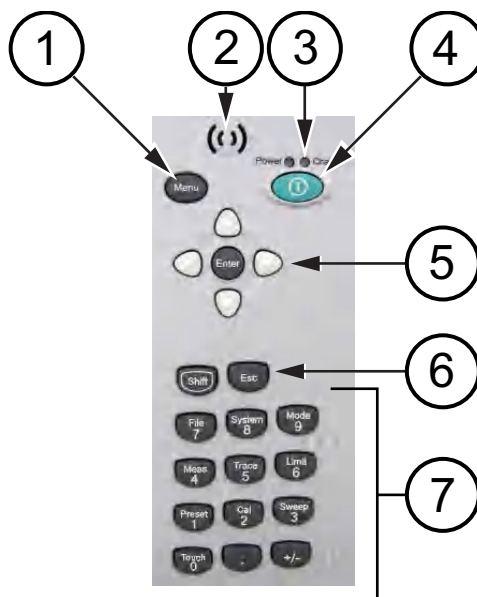
Figure 2-4.   Front Panel Layout

1.	Menu Key
2.	Speaker Grill
3.	LED Indicators for Battery Charge and Power
4.	On/Off Button
5.	Arrow Keys and Enter Key in center
6.	Shift Key and Escape Key
7.	Number Keypad

The terms button and hard key refer to all of the buttons on the instrument face. These keys perform as follows:

Menu Key

   (item 1 in Figure 2-4)

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

On/Off Button

(item 4 in Figure 2-4)

Press this button to turn on power to the PIM Master. Press and hold this button to turn off power.

Arrow Keys

(item 5 in Figure 2-4)

The four **Arrow** keys are used to scroll up, down, left, or right. The **Arrow** keys can often be used (depending upon measurement selection) to change a value or to change a selection from a list. In some measurements, the **Left/Right** arrow keys change values by different increments than the **Up/Down** arrow keys. The **Arrow** keys are also used to move markers.

Enter Key

(item 5 in Figure 2-4)

Press this key to finalize data input.

Shift Key

(item 6 in Figure 2-4)

Press the **Shift** key and then press a number key to open the menu that is indicated in text above the key number. When the **Shift** key is active, its icon is displayed at the top-right of the measurement display area between the battery charge indicator and the submenu key labels.

Figure 2-5.   Shift Key Icon

Esc Key

(item 6 in Figure 2-4)

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

LED Indicators (above the On/Off Button)

(item 3 in Figure 2-4)

Battery Charge LED (Green)

The Battery Charge LED flashes if the battery is charging, and remains on steady when the battery is fully charged.

Power LED (Green)

The Power LED remains on when the PIM Master is on.

Number Keypad

(item 7 in Figure 2-4)

Press these keys to directly input numbers. Number keys are also used to open menus when used with the "Shift Key". For example, press **Shift** and **Touch** (**0**) to initiate Touch Screen Calibration.

+/– Key

(item 7 in Figure 2-4)

Press this key to change the sign of numbers that are entered with the number keys.

2-5   Top Connector Panel

The top connector panel includes the test port connectors and the Radio Frequency On light.
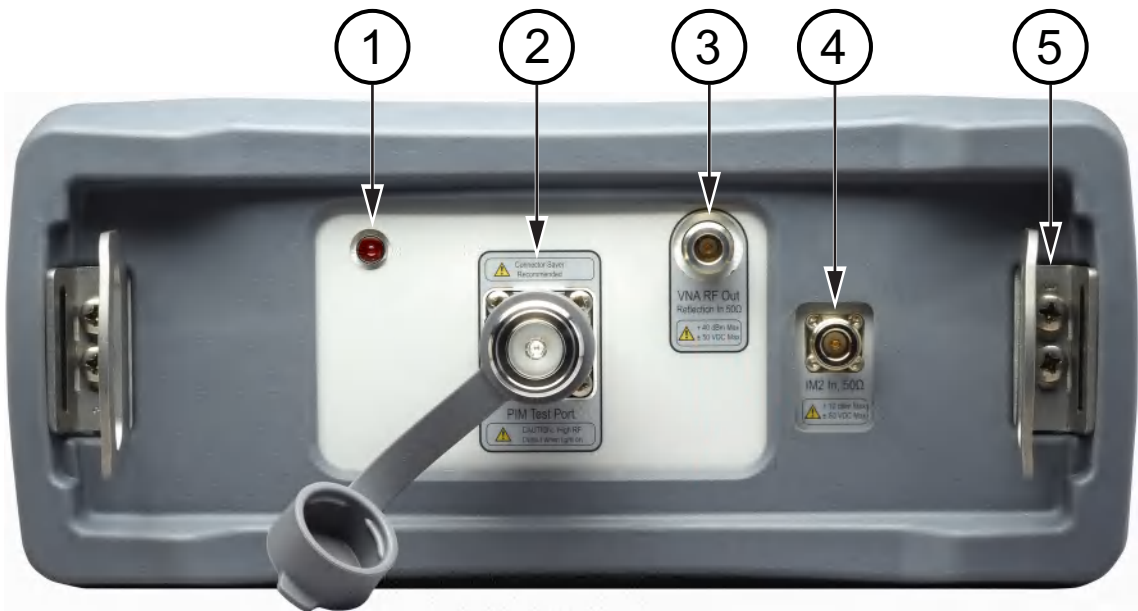
Figure 2-6.   PIM Master Top Panel Layout

1.	Indicator Light for RF On (Red)
2.	PIM Test Connector, 7/16 DIN, female, 50 Ω
3.	VNA RF Out Connector, Type-N, female, 50 ohms (Option 331)
4.	IM2 In Connector, Type-N, female, 50 ohms (Option 902)
5.	Strap Bracket (shown without strap), 2x

PIM Radio Frequency ON Light (item 1 in Figure 2-6)

This red indicator is illuminated when PIM RF output power is On.

PIM Test Connector (item 2 in Figure 2-6)

Type 7/16 DIN(f), 50 Ω test port connector that is used to perform PIM versus Time, Swept PIM, Noise Floor, and Distance-to-PIM (DTP) measurements.

To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the DIN connector. Do not over-tighten the connector. The recommended torque is 25 N ·m (~18 lbf ·ft). To prevent rotation, secure the PIM test connector or the recommended connector saver with a wrench when attaching a test lead.

Refer to "Connector Saver" on page 1-5.

VNA RF Out Connector (item 3 in Figure 2-6)

VNA RF Out Connector, Type-N, female, 50 ohms (Option 331). This test port is available only on instruments with Site Master Option 331. It is used to perform Return Loss, VSWR, Cable Loss, and Distance-to-Fault (DTF) measurements. Hand tighten this connection. Do not use a wrench.

IM2 In Connector (item 4 in Figure 2-6)

IM2 In Connector, Type-N, female, 50 ohms (Option 902). This test port is available only with frequency Option 902. It is used to receive second order intermodulation products. Hand tighten this connection. Do not use a wrench.

Strap Bracket (item 5 in Figure 2-6)

The Strap Brackets hold the Handle Strap and can accommodate a Carabiner. Note that each bracket is secured to the PIM Master with 2 screws. The handle is sewn to the brackets, but is not shown in the figure in order to reveal the bracket design. See Figure 2-23 on page 2-30 for the complete bracket, mounted and in use.

2-6   Top Connector Panel -- Option 703

The 2-port top connector panel includes the base features from Figure 2-6 plus those for the 2-port.
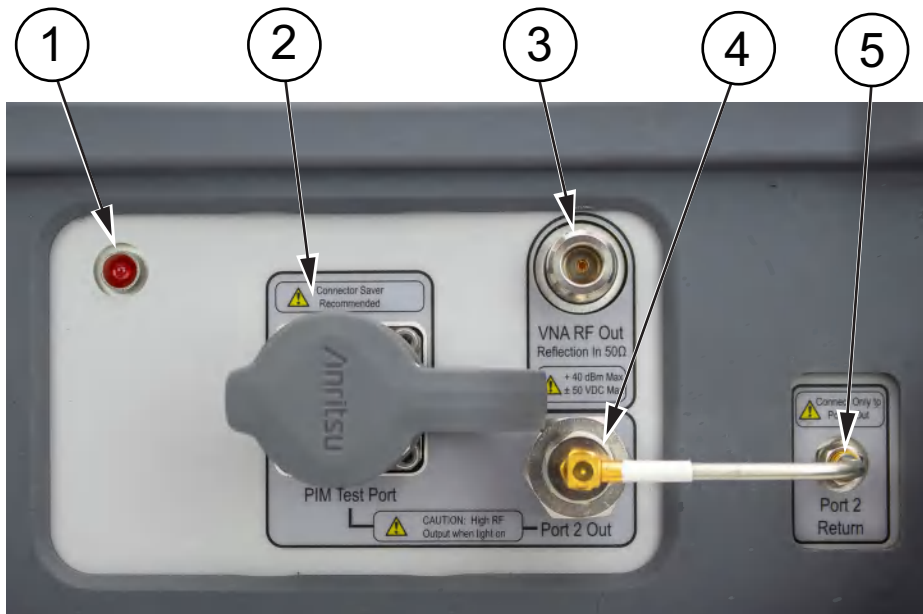
Figure 2-7.   PIM Master Top Panel Layout: 2-Port

1.	Indicator Light for RF On (Red)
2.	PIM Test Connector, 7/16 DIN, female, 50 Ω
3.	VNA RF Out Connector, Type-N, female, 50 Ω (Option 331)
4.	Port 2 Out Connector, 4.3-10, female, 50 Ω (Option 703)
5.	Port 2 Return Connector, Type SMA, female, 50 Ω (Option 703)
6.	Strap Bracket (not shown), 2x

Port 2 Out Connector (item 4 in Figure 2-7)

VNA RF Out Connector, 4.3-10, female, 50 ohms (Option 703). This test port is available only on instruments with 2-Port LTE Option 703. It is used to perform Return Loss, VSWR, Cable Loss, and Distance-to-Fault (DTF) measurements. Hand tighten this connection. Do not use a wrench.

Port 2 Return Connector (item 5 in Figure 2-7)

Port 2 Return Connector, SMA, female, 50 ohms (Option 703). This test port is available only on instruments with 2-Port LTE Option 703. Hand tighten this connection. Do not use a wrench.

Note	Use care to use all wrenches in such a way that the rigid cable is not impacted.

2-7   Side Panel Connectors

The side connector panel includes connectors for External Power, Ethernet/LAN, USB interface, and GPS.
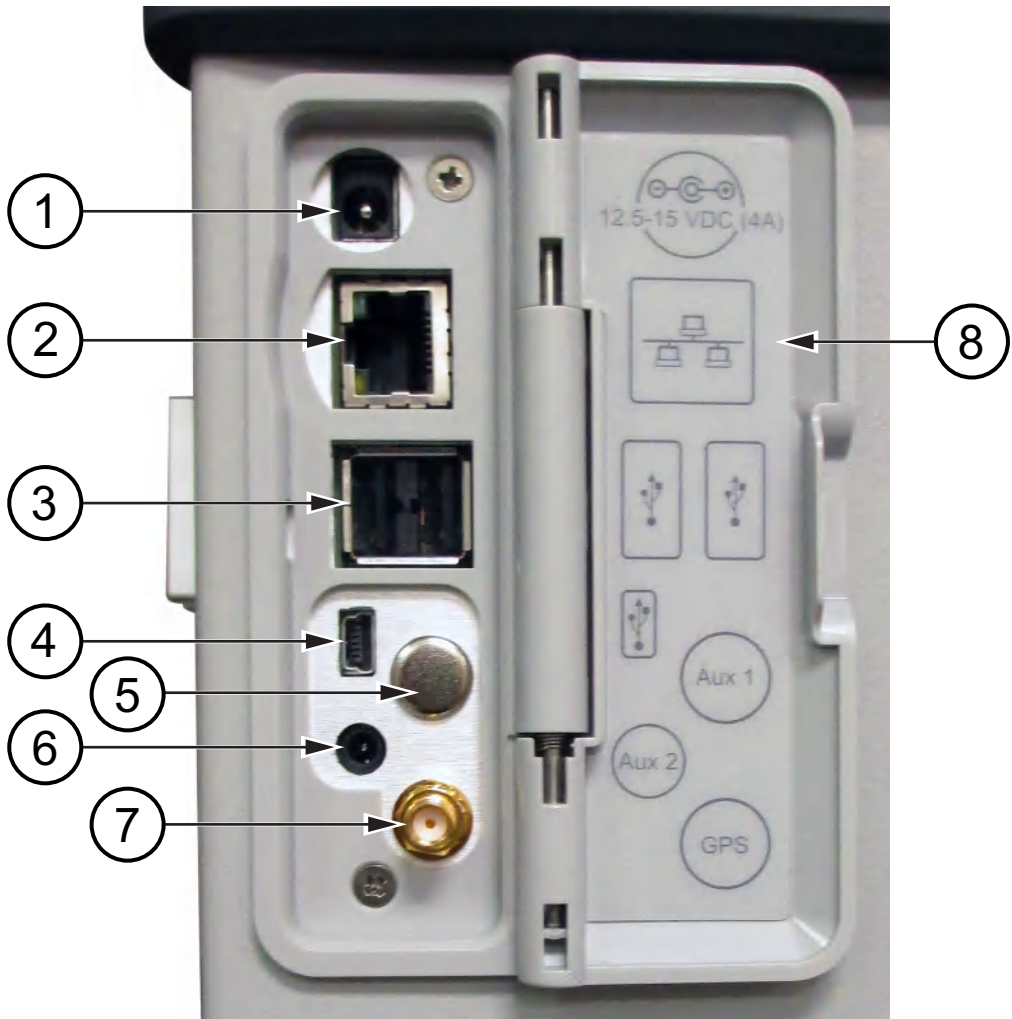
Figure 2-8.   PIM Master Side Panel Overview

1.	External Power
2.	LAN Connection, RJ45
3.	USB Interface, Type A
4.	USB Interface, 5-pin mini-B
5.	Auxiliary 1 (factory use only)
6.	Auxiliary 2 (factory use only)
7.	GPS Connector, SMA female (with Option 31)
8.	Legend (icons identify connection types)

External Power (item 1 in Figure 2-8)

This 2.1 mm by 5.5 mm barrel connector is used to power the unit and for battery charging. Input is 12 VDC to 15 VDC at up to 5.0 A.

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, then the user is at risk of receiving a severe or fatal electric shock.

LAN Connection (item 2 in Figure 2-8)

The RJ45 connector is used to connect the PIM Master to a local area network. Integrated into this connector are two LEDs. The amber LED shows the presence of a 10 Mbit/s LAN connection when on, and a 100 Mbit/s LAN connection when off. The green LED flashes to show that LAN traffic is present. For additional information about the LAN connection, Ethernet connection, and DHCP, refer to Appendix F, "LAN and DHCP".

USB Interface – Type A (item 3 in Figure 2-8)

This interface has two connectors for flash drive and USB Power Sensor. The MW82119B PIM Master can also be a USB Host and allow various USB Flash Memory devices to be connected to the instrument for storing measurements, setups, files, and firmware upgrades. Either USB connection can be used with a USB power sensor (but only one power sensor at a time).

USB Interface – Type Mini-B (item 4 in Figure 2-8)

The USB 2.0 interface can be used to connect the MW82119B PIM Master directly to a PC for data transfer. The first time the PIM Master is connected to a PC, the normal USB device detection by the computer operating system will take place. Drivers are available for Windows XP (or later).

Note	For proper detection, Line Sweep Tools should be installed on the PC prior to connecting the PIM Master to the USB port.

GPS Antenna Connector (Option 31) (item 7 in Figure 2-8)

The GPS antenna connection on the PIM Master is type SMA(F). Selectable +3 VDC or +5 VDC antenna power.

To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the SMA connector. Do not overtighten the connector. The recommended torque is 8 lbf ·in (0.9 N ·m or 90 N ·cm).

2-8   Measurement Display Overview

Throughout this manual, typical measurement displays are shown for the basic measurement modes of the PIM Master. Note that the images shown in this manual may be different from any images that are displayed on your PIM Master.

Front Panel Display Areas
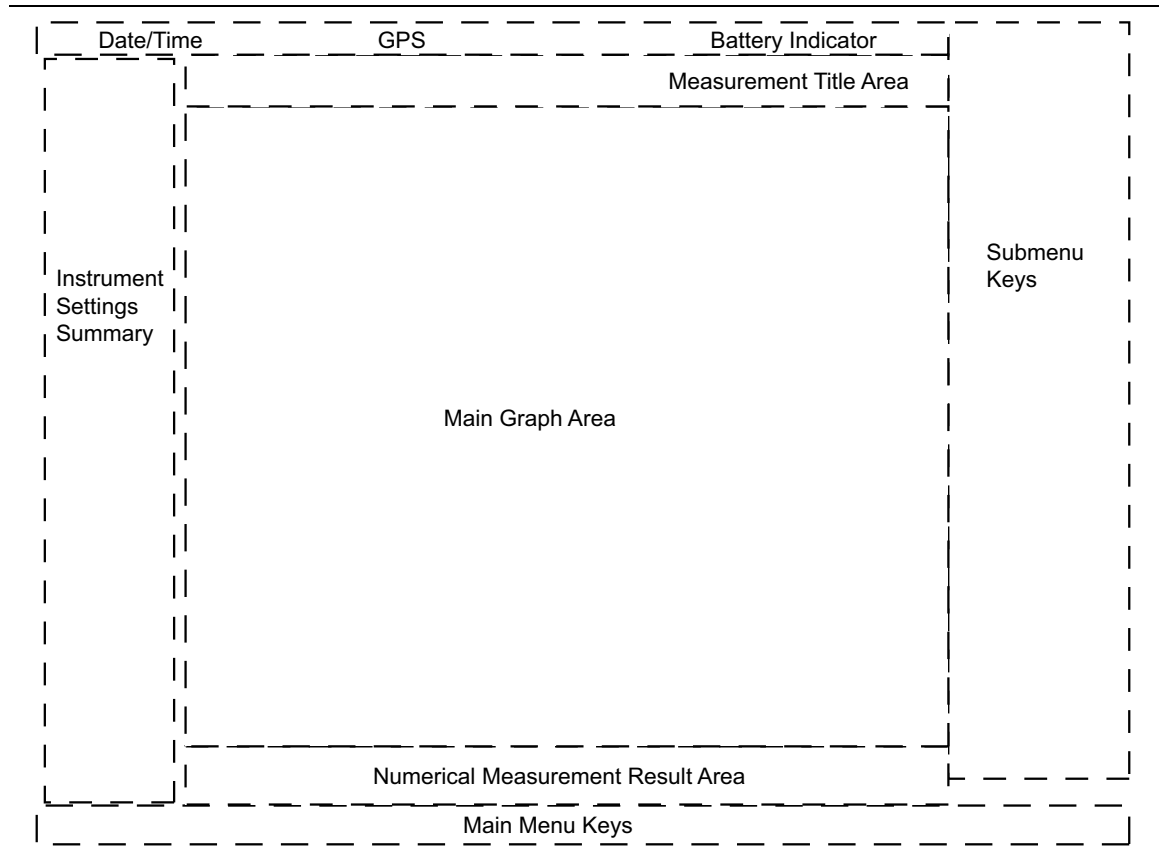
Figure 2-9.   Front Panel Overview

Main Menu Keys

The PIM Master menu-driven interface is easy to use and requires little training. The five Main Menu keys are located below the measurement display. These five keys are used to display the function-specific menus in the active menu (submenu labels). These Main Menu keys vary in function based on the selected mode of operation (**Shift, Mode** (9)) or measurement type within a mode. Refer to "Mode Selector Menu" on page 2-20 for more information on changing the instrument mode. Table 2-1 lists from left to right the Main Menu Key labels for each mode of instrument operation.

Table 2-1.   Mode-Dependent Main Menu Keys Located at Bottom of Measurement Display

Mode/Measurement Type	Key 1	Key 2	Key 3	Key 4	Key 5
PIM vs. Time	Freq	Amplitude	Setup	Measurements	Marker
Noise Floor	Freq	Amplitude	Setup	Measurements	Marker
DTP	Distance	Amplitude	Setup	Measurements	Marker
Swept PIM	Freq	Amplitude	Setup	Measurements	Marker
High Accuracy Power Meter[a]		Amplitude	Average	Zero/Cal	Limit
Cable & Antenna	Freq/Dist	Amplitude	Sweep/Setup	Measurements	Marker

a.If High Accuracy Power Meter (option 19) is installed.

Submenu Keys

The eight submenu keys are located to the right of the measurement display. They change function depending upon the current mode and current menu selection. The current submenu title is shown at the top of the active function block (submenu key labels). For an example, refer to item 6 in Figure 2-10 on page 2-15.

Front Panel Layout, PIM vs. Time

The following three figures are provided to identify display components in different measurement modes. The image and measurement details shown on your instrument may differ from the examples in this user guide.
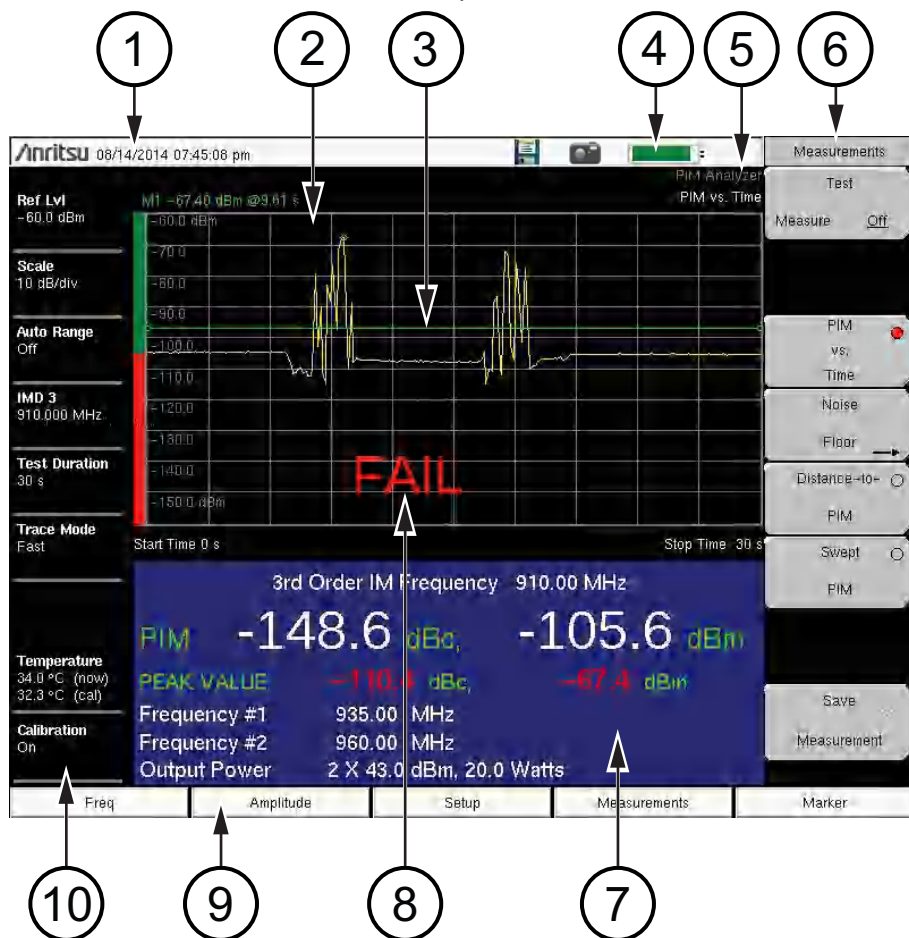
Figure 2-10. Front Panel Layout with PIM vs. Time Display

1.	Real Time Clock (followed by GPS Coordinates if Option 31 is installed)
2.	Main Graph Area or Sweep Window or Measurement Grid
3.	Limit Line (Green line, set from Limit menu)
4.	Battery Status Icon
5.	Instrument Mode and Measurement Title
6.	Submenu Keys or Active Function Block
7.	PIM Summary Table
8.	Pass/Fail Indicator (set from Limit menu)
9.	Main Menu Keys
10.	Instrument Settings Summary

Front Panel Layout, Distance-to-PIM
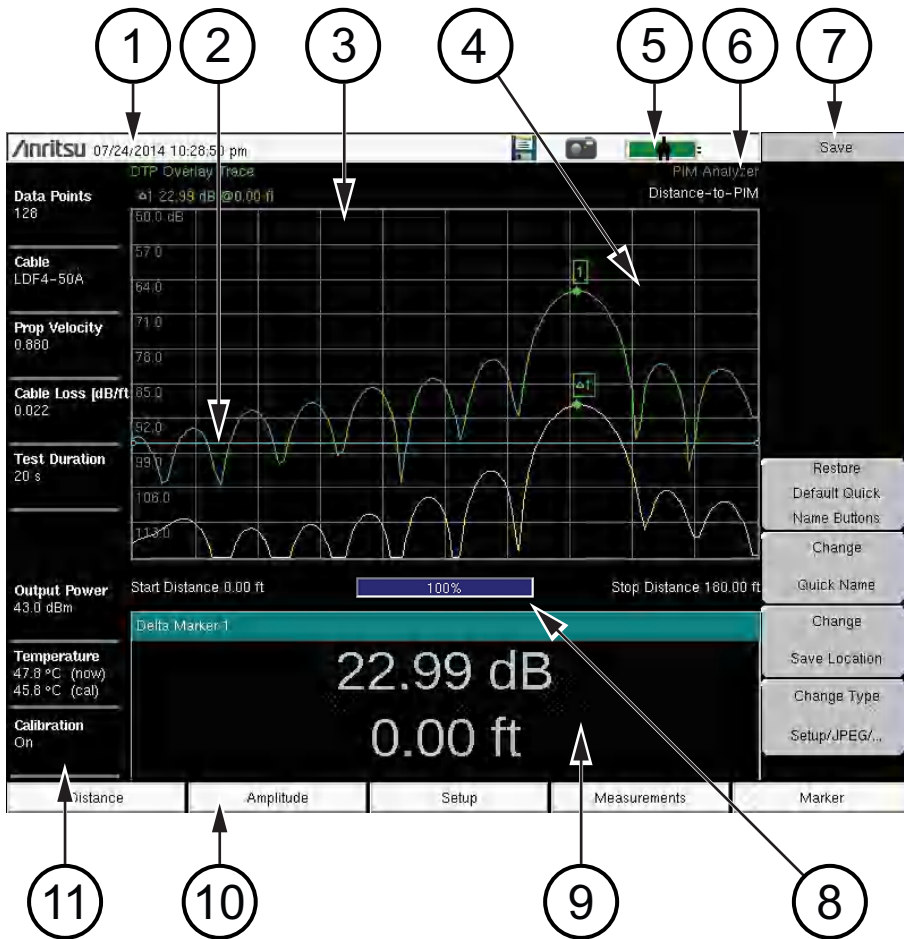
Figure 2-11.   Front Panel Layout with Distance-to-PIM Display

1.	Real Time Clock (followed by GPS Coordinates if Option 31 is installed)
2.	Reference Limit Line (blue line, set from Limit menu)
3.	Main Graph Area or Sweep Window or Measurement Grid
4.	Marker on Distance-to-PIM Measurement Trace
5.	Battery Status Icon
6.	Instrument Mode and Measurement Title
7.	Submenu Keys or Active Function Block
8.	Progress Indicator
9.	Marker Table (set to Large)
10.	Main Menu Keys
11.	Instrument Settings Summary

Front Panel Layout, Swept PIM
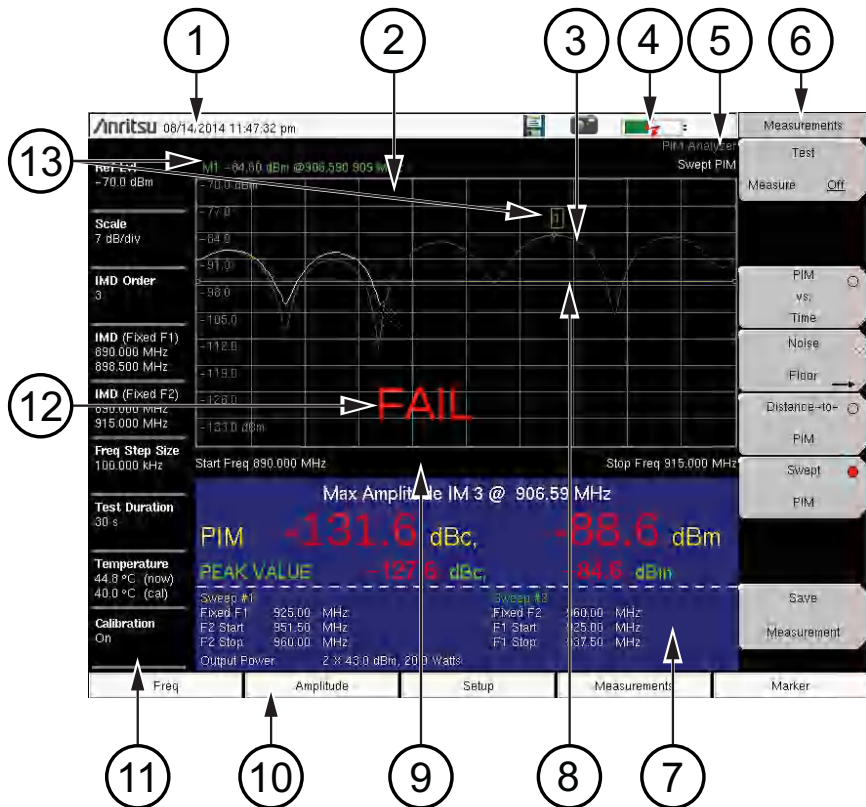
Figure 2-12. Front Panel Layout with Swept PIM Display

1.	Real Time Clock (followed by GPS Coordinates if Option 31 is installed)
2.	Main Graph Area or Sweep Window or Measurement Grid
3.	Swept PIM Measurement Trace (green trace and yellow trace)
	The yellow trace is created by holding F1 fixed and sweeping F2. The green trace is created by holding F2 fixed and sweeping F1. The PIM Summary Table displays the frequencies that are used to generate each sweep. In this display, the green trace (Sweep #2) is visible only in the first few MHz of the sweep. Note that the PIM Summary Table displays the Sweep numbers in yellow and green.
4.	Battery Status Icon
5.	Instrument Mode and Measurement Title
6.	Submenu Keys or Active Function Block
7.	PIM Summary Table
8.	Limit Line (green)
9.	Progress Indicator
10.	Main Menu Keys
11.	Instrument Settings Summary
12.	Pass/Fail indicator
13.	Marker and marker data automatically displayed

Front Panel Layout, C&AA (Option 331)
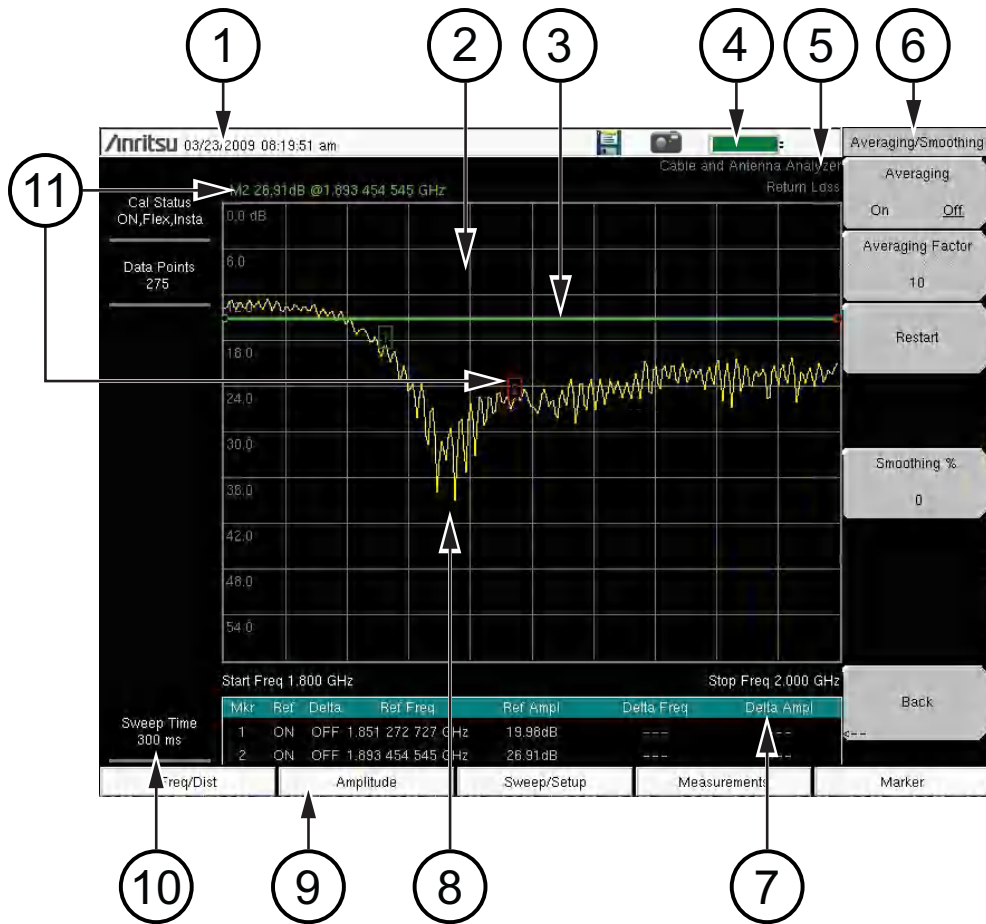
Figure 2-13. Front Panel Layout with Return Loss Display

1.	Real Time Clock (followed by GPS Coordinates if Option 31 is installed)
2.	Main Graph Area or Sweep Window or Measurement Grid
3.	Limit Line (green)
4.	Battery Status Icon
5.	Instrument Mode and Measurement Title
6.	Submenu Keys or Active Function Block
7.	Marker Table
8.	Return Loss Measurement Trace
9.	Main Menu Keys
10.	Instrument Settings Summary
11.	Marker and marker data automatically displayed for active Marker [M2]

2-9   Secondary Function Menus

Pressing the **Shift** key and then a number key selects the menu function that is printed above the key number (Figure 2-14).
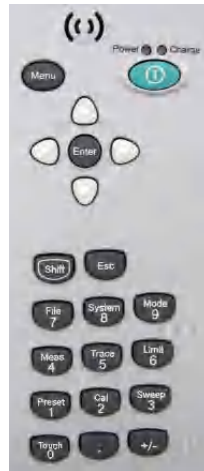
Figure 2-14. Keypad and Secondary Function Menus

Not all Secondary Function Menus are active in various operation Modes. If any one of these menus is available in a specific instrument Mode of operation, then it can be called from the number keypad. It may also be available from a main menu key or a submenu key.
The 10 Secondary Function Menus are:

    0   Touch Screen Calibration (and Arrow Navigation)

    1   Preset

    2   Calibration

    3   Sweep

    4   Measurements

    5   Trace

    6   Limit

    7   File

    8   System

    9   MODE

2-10   Mode Selector Menu

To access the functions under the Mode menu, select the **Shift** key, then the **Mode** (**9**) key.
Use the directional **Arrow** keys to highlight the selection, and press the **Enter** key to select.
The list of modes that appears in this menu will vary depending upon the options that are
installed and activated in your instrument. Figure 2-15 is an example of the Mode menu.
Your instrument may not show the same list.
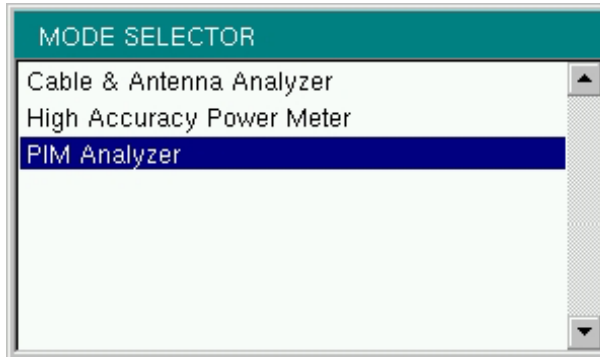
Figure 2-15. Mode Selector Menu

2-11   Menu Key

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

Figure 2-16 shows the **Menu** key screen without any user shortcuts. Touch one of the icons in the top two rows to change modes. The icons that are shown here are preinstalled and cannot be moved or deleted. The display of the Menu screen will vary depending on instrument model, firmware version, and installed options. The image in Figure 2-16 may differ from the menu on your instrument.
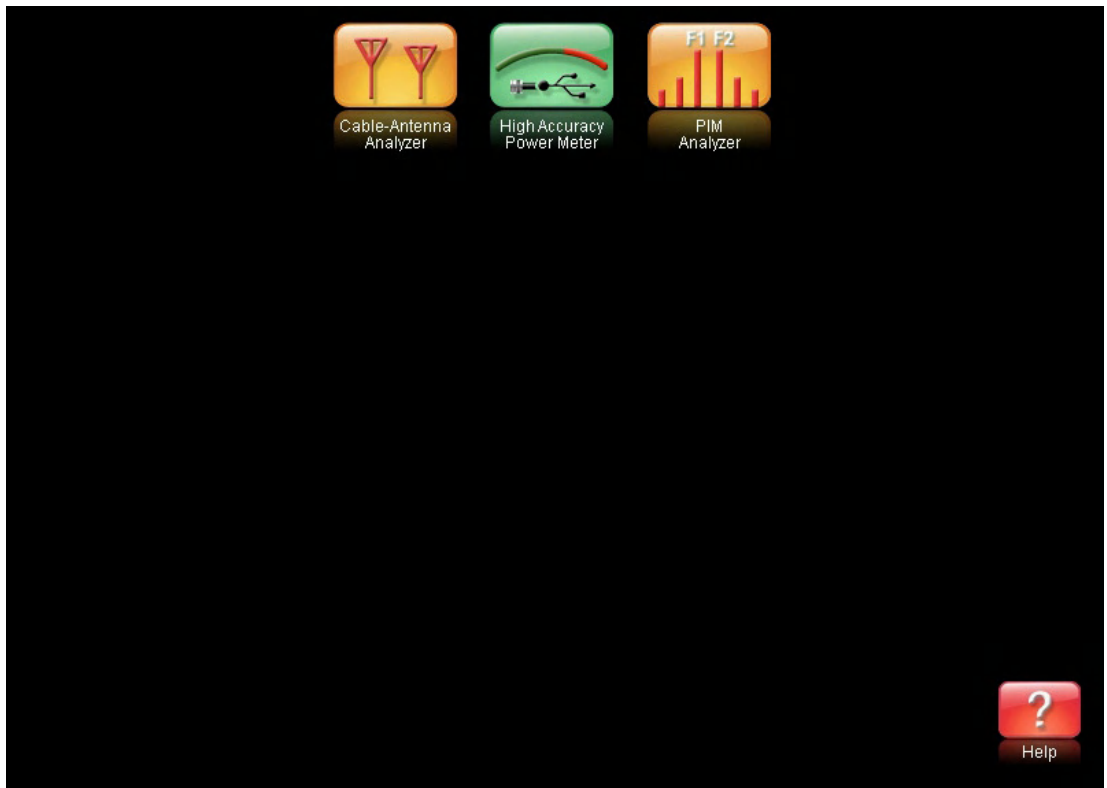
Figure 2-16. Menu Key Screen, Icons for Installed Measurements

Note	The High Accuracy Power Meter icon is present only if Option 19 is installed. See Appendix A, "Other Documents" for information about this publication.

Figure 2-17 shows the **Menu** key screen with shortcut icons for features of the installed measurement modes and additional user-defined shortcuts to menus and setup functions.

Press and hold down any key for a few seconds to add a shortcut to this screen. For example, to create a shortcut for PIM versus Time measurements, open the PIM Master Measurements menu and hold down on the PIM vs. Time submenu key for a few seconds. The PIM Master displays a grid (occupied locations show their shortcut), then select the location for the shortcut. The display of the Menu screen will vary depending on instrument model, firmware version, and installed options. The image in Figure 2-17 may differ from the menu on your instrument.
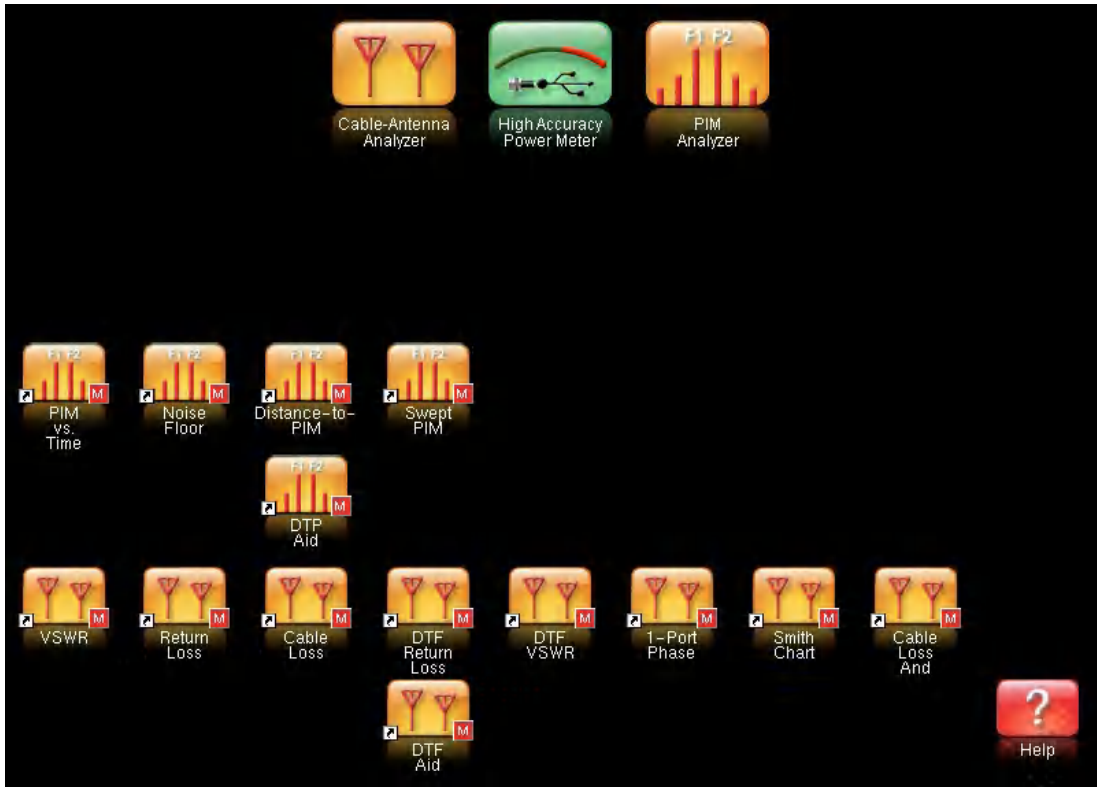
Figure 2-17. Menu Key Screen, Icons for Installed Measurements and Shortcuts

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

Note	The Master Reset will delete all user-created shortcut icons from the Menu screen. Refer to the "Reset Menu" on page 5-7 for additional information. To retain shortcuts during a firmware update, select the "Save & restore user data" option shown in Figure E-5 on page E-8.

Help for the Menu shortcut screen is available by pressing the question mark icon in the lower-right corner of the display.
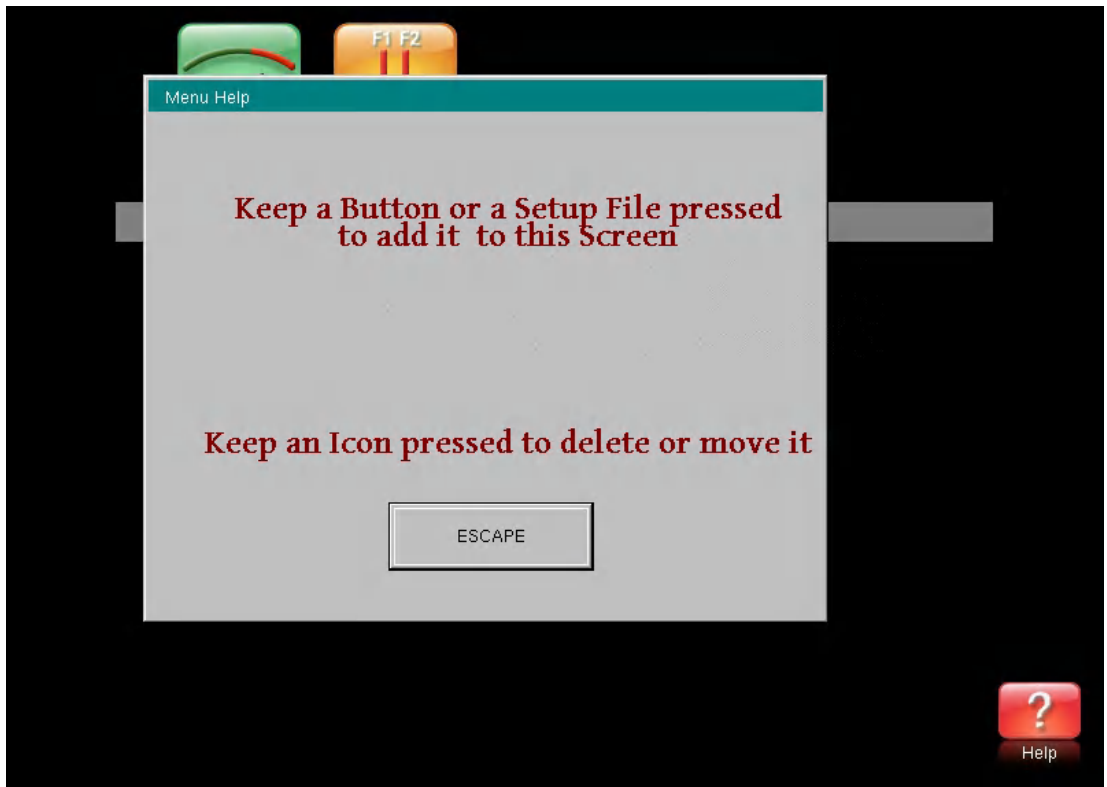
Figure 2-18. Menu Help

2-12   Touch Screen

The touch screen and keypad are used for data entry. The sweep window and surrounding screen areas provide measurement information (see Figure 2-9, "Front Panel Overview" on page 2-13).

Graphical User Interface (GUI)

The measurement display, or sweep window, provides measurement trace data. Above the grid and trace data, additional measurement data are displayed, and the analyzer mode is shown in the top-right corner. The lower area of the grid may be reduced in size to display an optional data window, such as a table of measurement data or marker data. To the left of the grid and trace data is the instrument settings summary; below the grid are the five main menu touch keys; to the right are the submenu touch keys. For a list of the main menu keys in different instrument modes, refer to "Main Menu Keys" on page 2-14.

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

For example:

- If you touch the **Scale** setting on the left side of the display (Instrument Settings Summary), then the Amplitude menu is displayed, and the Scale submenu key is active. **Scale** is displayed in PIM vs. Time and Swept PIM measurements.

- If you touch **Data Points** (Instrument Settings Summary), then the DTP Parameters setup window is displayed, and the Data Points parameter is selected (Distance-to-PIM measurements.

- If you touch **Cable** (Instrument Settings Summary), then the Cable List is displayed (Distance-to-PIM measurements).

- If you place a marker on the screen, then you can touch the measurement trace to relocate the marker.

- If you touch the file type list box in one of the file management dialog boxes, then you can open the Filetype drop-down list to select a file type.

Main Menu Touch Screen Keys

The main menu key functions change to match specific instrument Mode settings. The main menu keys generate function-specific submenus. The measurement modes are selected by pressing the **Shift** key and then the **Mode** (**9**) key. For more details about the Mode menu, refer to "Mode Selector Menu" on page 2-20.

Submenu Touch Screen Keys

The submenu touch keys are located in the active function block (submenu key labels) along the right edge of the display. The submenu labels change as instrument measurement and parameter settings change. The current submenu title is shown at the top of the submenu key block. An example of the keys is shown in Figure 2-10 on page 2-15. Additional details are described in Section 2-8 "Measurement Display Overview" on page 2-13.

2-13   Touch Screen Calibration

The Calibrate Touch Screen submenu key is in the "System Menu" on page 5-3. When pressed, the touch screen calibration message box is displayed with instructions for calibration. Calibration optimizes the response of touch input. You touch targets in sequence as they are displayed on the touch screen. This requires less than one minute.

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

You can also press **1** to use arrow navigation.

Calibrate Touch Screen Shortcut

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

Arrow Navigation

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

In arrow navigation mode, a red selection box surrounds a key (see Figure 2-19 on page 2-26 in which the Carrier F1 submenu key is selected). To move the red selection box, use the **Arrow** keys above the number keypad (see Figure 2-14 on page 2-19). Then press the **Menu** key to activate the selected touch screen key. Note that only the main menu keys and submenu keys can be activated by using Arrow Navigation. When using the File management menus for Copy, Recall, and Delete, however, you can press the +/– key to change focus of the arrow navigation from the menu keys to the lists in the dialog box and back to the menu keys. Arrow navigation places a green selection box around the Source or Destination file group (depending on the selection toggled in the Scroll submenu key). You can then use the arrow keys to navigate and select files. This feature does not move the arrow navigation selection box into any other areas of the touch screen.

To save a measurement in arrow navigation mode, press **Shift** then **File** (**7**). Use the **Arrow** keys to move the red selection box to the Save Measurement As submenu key. This submenu key must be used because the arrow navigation mode cannot be used to change data in popup windows in the measurement display. Filenames are determined by the current setting of the Save Measurement As submenu key. Refer to "Save Measurement As" on page 4-12.

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

To return to normal touch entry mode, reboot the instrument (turn power Off and then On). If your touch screen has been damaged, then refer to Section 1-2 "Instrument Description" on page 1-3.
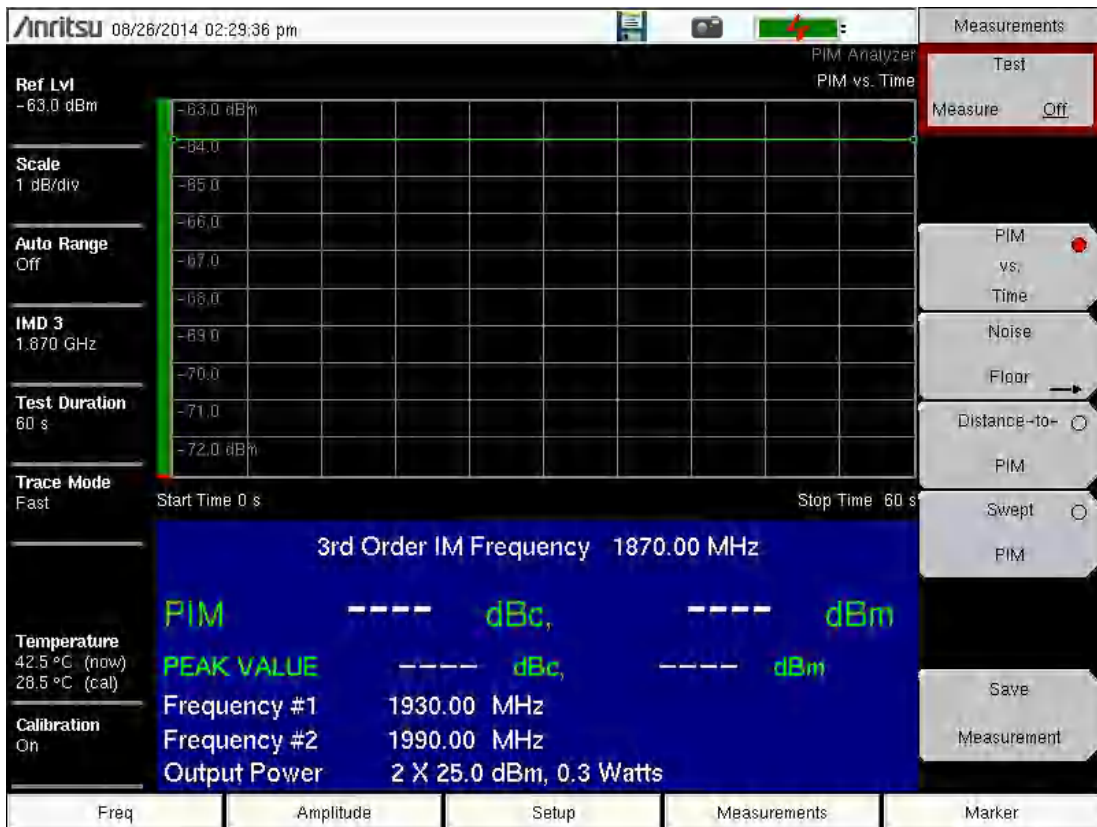
Figure 2-19. Arrow Navigation Mode

2-14   Parameter Setting

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

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

2-15   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 2-2.   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: Image of a 3.5 inch floppy disk drive, shortcut to the Save Menu
	Camera Icon: Saves a JPEG image of the current screen display
Shift	**Shift Key Icon:** This icon is displayed between the battery symbol and the submenu keys after the **Shift** key has been pressed, and until another key is pressed.
GPS GPS	**GPS Icon:** This icon is displayed right after the date and time when GPS is available. For additional details, refer to Chapter 6, "GPS (Option 31)".
	Power Button with Power LED and Charge LED: This is a physical button with LED indicators. It is located near the number keypad.

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

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

Touch the storage icon to open the touch screen keyboard for saving measurements, setups, limit lines, or screen display JPEG files (see Figure 4-1, "Save Dialog Box" on page 4-4).

2-16   Soft Carrying Case

The PIM Master can be operated while in the soft carrying case by opening the front flap (secured by two zippers).

Figure 2-20. Case Open to Operate the PIM Master

The case is padded on all sides and contains protective inserts in the front and back panels. An additional flap at the top of the rear panel can be folded over the PIM Master top connector panel for additional protection.

To install the instrument into the soft carrying case:

1. The Back panel of the case is secured with two zippers that start at the bottom of each side. Fully close the front panel of the case to help support the shape of the case while you are inserting the PIM Master into the back.

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

3. Open the zippered back of the case.

4. Insert the instrument face down into the case, taking care that the connectors are properly situated in the case top opening. Refer to the tilting of the instrument as shown in Figure 2-21. Note that the instrument in this figure may differ from your model. The method of insertion remains the same.

Figure 2-21. Putting PIM Master into Soft Case

5. Close the back panel and secure with one or both zippers to securely enclose the PIM Master.

6. Two pairs of additional straps cross over the top of the PIM Master (inside the strap brackets) to keep the soft case closed securely around the instrument. These straps have hook-and-loop fasteners. See Figure 2-23 on page 2-30.

7. An additional flap (sewn to the back cover) with a protective insert can be folded over the center of the top connector panel. It attaches to the front of the case by hook-and-loop fasteners. This flap is shown closed in Figure 2-22 on page 2-30.

A side flap provides access to the side panel. Inside and below the panel is a pocket to hold a wireless router. The router connecting cables can be enclosed by the side flap.

Figure 2-22. Access to Side Panel

Figure 2-23. Instrument Enclosed in the Soft Carrying Case

2-17   Tilt Bail Stand

A tilt bail is attached to the back of the PIM Master for desktop operation. 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 until it attaches to the PIM Master.

Figure 2-24. Tilt Bail Extended

Chapter 3 — Quick Start Guide

Warning	The Anritsu PIM Master is capable of producing 80 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields:
	Always terminate the PIM output port of the test equipment into a load, a loaded line, or a line that will radiate or absorb the energy before beginning a PIM test.
	Confirm that the PIM Master RF power is off after a PIM test.
	Always confirm that the PIM RF power is off before disconnecting a coaxial connection, otherwise RF burns may result. Immediate burns to fingers or eyes can result from exposure to live connectors.
	Ensure that all antennas under test are placed so that no personnel are exposed to RF levels that exceed the maximum allowable exposure.

3-1   Introduction

This chapter describes the basic setup and use of the PIM Master for performing Line Sweep (cable and antenna analysis, or CAA) and PIM measurements (Option 331). Tasks common to all PIM measurements are also introduced here.

3-2   Measurement Mode Selection

Press the **Menu** key and use the touch screen to select the appropriate measurement icon.
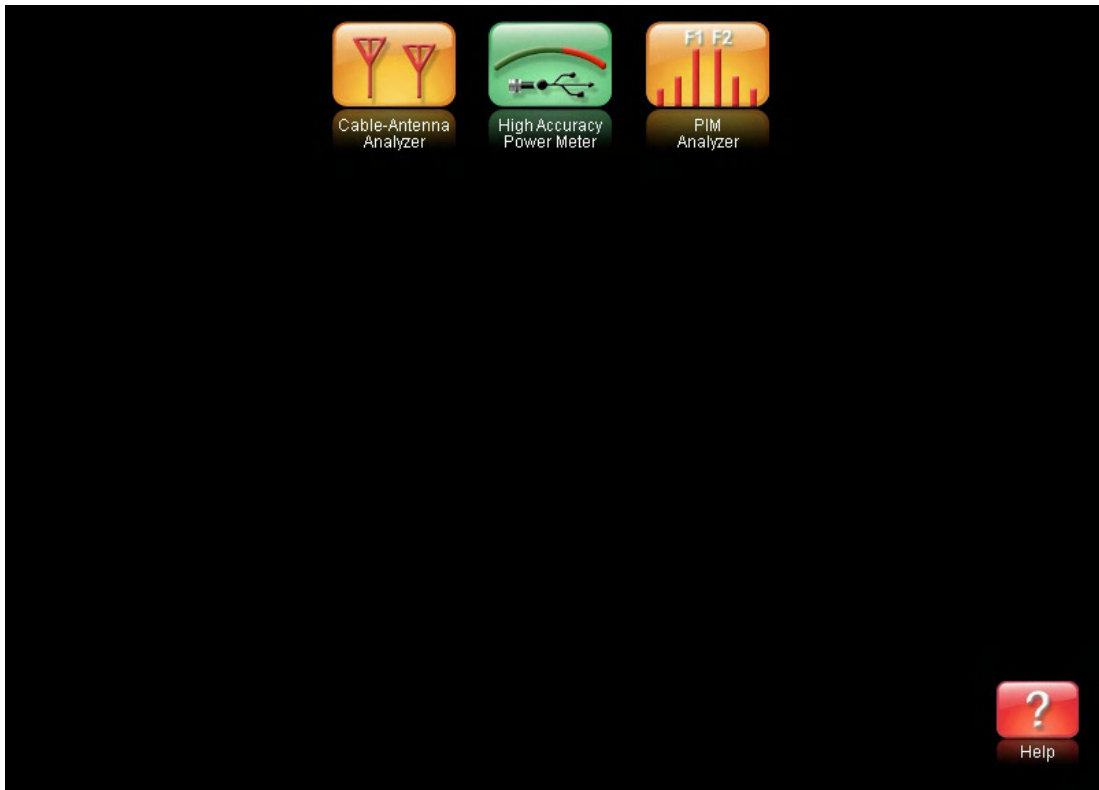
Figure 3-1.   Menu Screen with Icons for Installed Measurement Modes

Note	The display of the Menu screen will vary depending on installed options.

3-3   Cable & Antenna Analyzer Measurements (Option 331)

Set the instrument to Cable & Antenna Analyzer mode (refer to Section 3-2 "Measurement Mode Selection" or "Menu Key" on page 2-21). This section is a brief introduction to cable and antenna analysis. For more details, refer to the Cable and Antenna Analyzer Measurement Guide that is listed in Appendix A.

Select the Measurement Type

Press the **Measurement** main menu key and select the appropriate measurement.
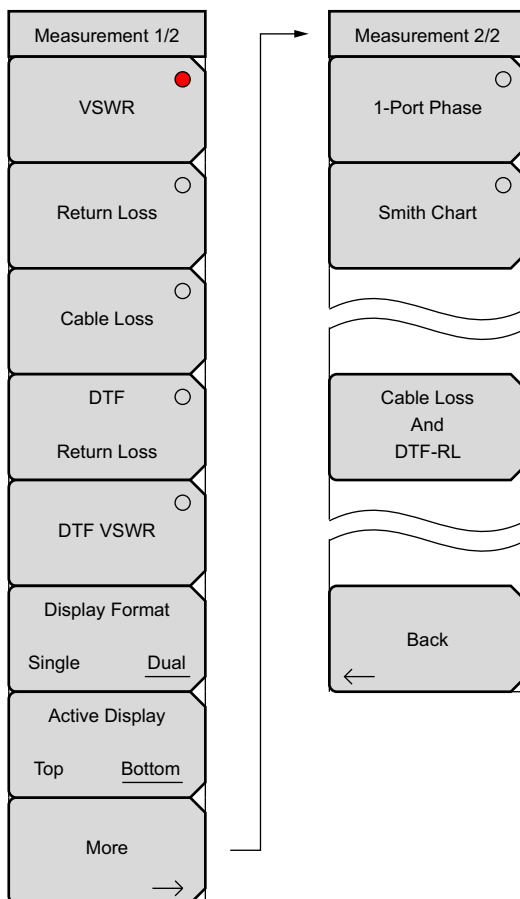
Figure 3-2.   C&AA Measurement Menus

Set the Frequency

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

2. Press the Start Freq submenu key and use the keypad or the arrow keys to enter the start frequency.

3. Press the Stop Freq submenu key and use the keypad or the arrow keys to enter the stop frequency.

Set the Amplitude

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

2. Press the Top submenu key and use the keypad or the arrow keys to edit the top scale value. Press **Enter** to set.

3. Press the Bottom submenu key and use the keypad or the arrow keys to edit the bottom scale value. Press **Enter** to set.

Note	For Amplitude in Smith Chart measurements, refer to "Smith Chart" on page 2-23 of the Cable & Antenna Measurement Guide listed in Appendix A.

Turn on Markers

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

2. Press the Marker 1 2 3 4 5 6 submenu key and select the marker number 1 button using the touch screen. The underlined number on the Marker submenu key indicates the active marker.

3. Use the arrow keys or the keypad to move the marker. The current value for the selected marker is shown above the upper-left corner of the graph. It is also possible to drag the marker using the touch screen.

4. Delta Markers are available for each of the six reference markers. For the selected marker, Toggle the Delta On/Off submenu key to turn on the Delta marker.

Peak/Valley Auto Markers

When making Return Loss and VSWR measurements, the Peak/Valley Auto feature can be used to automatically turn on Marker 1 to peak, Marker 2 to valley, and display M1 and M2 in the Marker Table. This feature is not available for DTF measurements.

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

2. Press the Peak/Valley Auto key.

Single Limit Line

1. Press **Shift** and then **Limit** (6) to enter the Limit menu.

2. Press the Limit On/Off key to turn on the Limit.

3. Press Single Limit and then use the numeric keypad or the arrow keys to change the limit value and then press **Enter**.

Note	Refer to the Cable & Antenna Measurement Guide listed in Appendix A for creating multi-segment limit lines.

4. Press the Limit Alarm key to turn on or off the Limit Alarm.
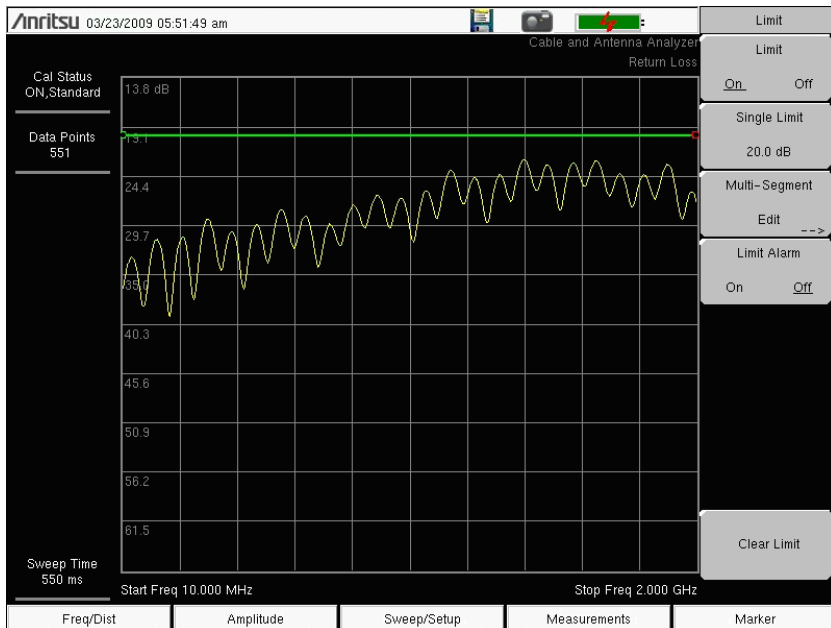
Figure 3-3.   Single Limit Lines

DTF Setup

1. Press the **Measurements** main menu key and select DTF Return Loss or DTF VSWR.

2. Press the **Freq/Dist** main menu key.

3. Press the Units submenu key and select m to display distance in meters or ft to display distance in feet.

4. Press DTF Aid and use the touch screen, or arrow keys to navigate through all the DTF parameters.

  a. Set Start Distance and Stop Distance. Stop Distance needs to be smaller than Dmax.

  b. Enter the Start and Stop frequencies.

  c. Press Cable, select the appropriate cable from the cable list and press **Enter**.

  d. Press Continue.
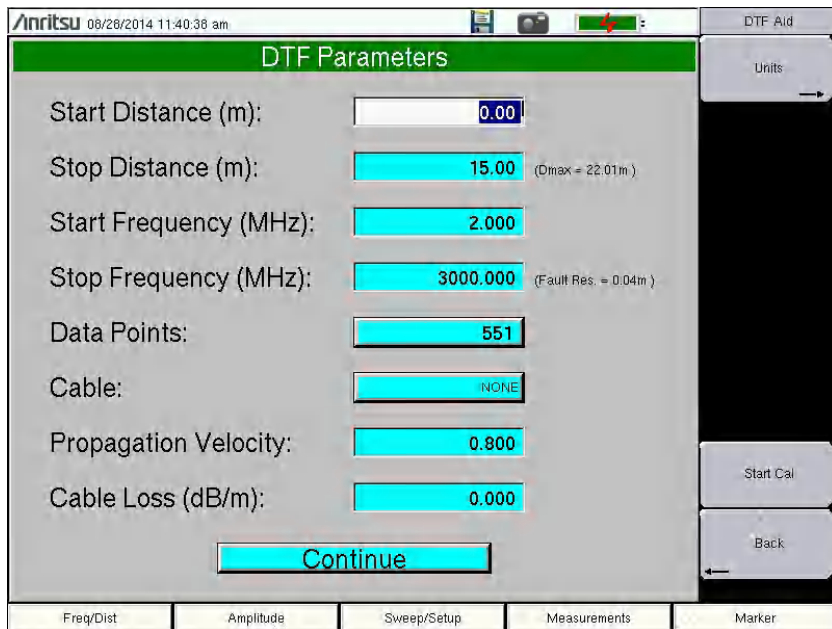
Figure 3-4.   DTF Aid

5. Press **Shift** then **Calibrate** (2) to calibrate the instrument. Refer to "Calibrate with OSL Calibration" on page 3-7 for additional information.

6. Press the **Marker** main menu key and set the appropriate markers.

7. Press **Shift** and **Limit** (6) to enter and set the appropriate limit lines.

8. Press **Shift** and **File** (7) to save the measurement. Refer to Chapter 4, "File Management" for details.

Calibrate with OSL Calibration

Note	Refer to the Cable & Antenna Measurement Guide listed in Appendix A for calibration details.

1. Press the **Freq/Dist** main menu key and enter the appropriate frequency range

2. Press **Shift** then **Calibrate** (**2**) key.

3. Select Standard or FlexCal.

4. Press Start Cal and follow instructions on screen.

5. Connect Open to RF Out and press the **Enter** key.

6. Connect Short to RF Out and press the **Enter** key.

7. Connect Load to RF Out and press the **Enter** key.

8. Verify that the calibration has been properly performed by checking that the Cal Status message is now displaying "ON, Standard" or "ON, FlexCal".
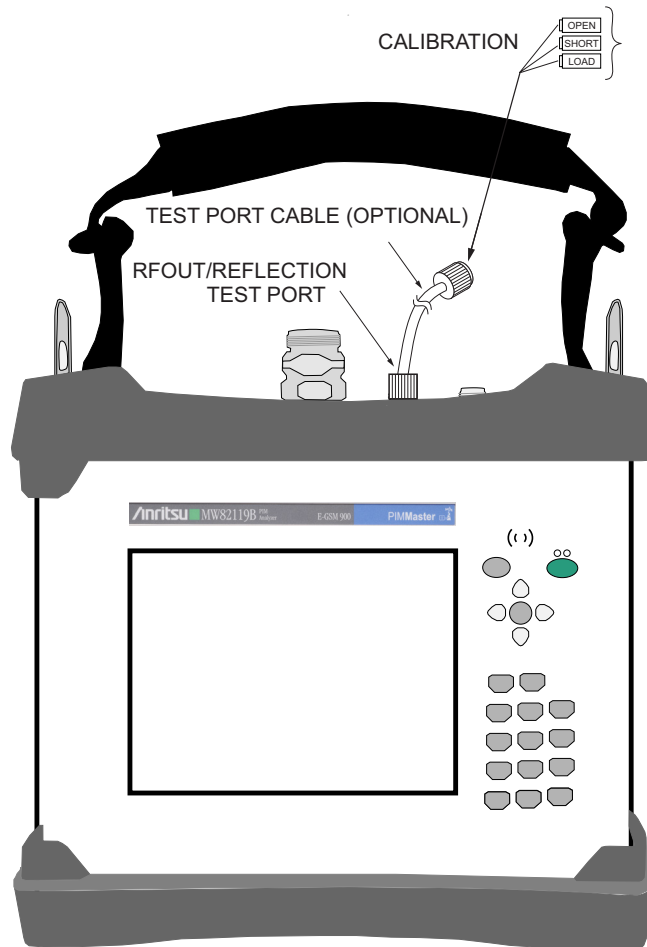
Figure 3-5.   Calibration Setup with OSL Cal Standards

3-4   Passive Intermodulation (PIM) Measurements

Set the instrument to PIM Analyzer mode (refer to "Mode Selector Menu" on page 2-20 or "Menu Key" on page 2-21). This section is a brief introduction to PIM analysis. For more details, refer to the Passive Intermodulation Analyzer Measurement Guide that is listed in Appendix A.

Preparing for PIM Measurements

Along with your PIM Master, you need tools and components that are provided in the accessory kit, and you need to set up the instrument for your planned measurements.

Checking Required Tools and Components

The following items are supplied with your PIM Master accessory kit or can be ordered separately as individual components. Consult your Technical Data Sheet for part numbers.

- Test cable
- Connector Saver (refer to "Connector Saver" on page 1-5)
- RF Adapters
- PIM Standard
- Low PIM Load
- Torque Wrench
- Adjustable Wrench
- Cleaning Kit

Setting Up the PIM Master

To prepare the PIM Master for measuring PIM, put the it in PIM Analyzer mode.

Before calibrating the PIM Master, set the parameters for the four measurement types. This will eliminate the need for recalibrating due to changing parameters. To set up the parameters for the four measurement types, perform these steps. See Passive Intermodulation Analyzer Measurement Guide that is listed in Appendix A for complete instructions for set up and calibration of the instrument.

To set up PIM vs. Time measurements:

1. Press the **Measurements** main menu key and then press the PIM vs. Time submenu key.

2. Press the **Freq** main menu key, then select the input frequencies for the F1 and F2 carriers, and then select the intermodulation order.

    a. Press the Carrier F1 submenu key and set the desired frequency.

    b. Press the Carrier F2 submenu key and set the desired frequency.

    c. If necessary, press the Intermod Order submenu key until the desired setting is underlined (3rd, 5th, or 7th).

    d. If necessary, press the Band Select submenu key until the desired High or Low setting is underlined (or one of the following with Option 194: PCS or PCS/AWS, Option 600: 1900 MHz or 600 MHz, Option 902: IM2 or GSM).

3. Press the **Setup** main menu key to set the power level and test duration.

To set up Distance to PIM measurements:

1. Press the **Measurements** main menu key and then press the Distance-to-PIM submenu key.

2. Press the **Setup** main menu key, then the DTP Aid submenu key.

3. On the DTP Parameters screen, use the touch screen to enter or select values for Distance, Data Points, and Cable type (or enter Cable Loss and Propagation Velocity).

To set up Noise Floor measurements:

1. Press the **Measurements** main menu key and then press the Noise Floor Measurements submenu key.

2. Choose Time View or Spectrum View and if Spectrum View whether to calibrate.

3. Press Freq key to set.

To set up Swept PIM measurements:

1. Press the **Measurements** main menu key and then press the Swept PIM submenu key.

2. Choose 1- or 2- Port mode.

3. Choose High or Low band (2-port mode only works with Low band).

4. Select 3rd, 5th, or 7th intermodulation order.

5. Press Swept PIM Aid to set up the markers for Swept PIM measurements.

After setting up the measurement types, visually inspect all RF connectors on the test instrument, the test lead, the PIM standard, and the Low PIM Load. Clean connections each day prior to first use.

Note	Save your instrument settings in a setup file to allow easy recall of frequently used settings.

Calibrating the PIM Analyzer

Caution	During calibration, RF power is present, and the red RF On light is illuminated.

Calibrations are temperature-dependent. A temperature deviation of approximately 20 degrees Celsius voids an existing calibration. Two temperatures are displayed in a white font (in all PIM measurement modes) in the Instrument Settings Summary, just above the Calibration On/Off message. One is the temperature in the PIM Master now, and the other is the temperature in the PIM Master at calibration.

When the current temperature (labeled **now**) changes ±8 °C of the calibration limit, the font color of the current temperature is displayed in yellow. This color changes to red if the current temperature exceeds the calibration limit ±10 °C from the calibration limit. **N/A** is displayed for the calibration temperature when no valid calibration file exists for the current instrument settings.

All calibrations are valid for an initial 12-hour limit. If the PIM Master remains On, and if all settings remain consistent, then the current calibration file remains effective. If any setting is changed after 12 hours, including a power cycle of the PIM Master (Off and On), then a warning is presented indicating that the current calibration is more than 12 hours old. The message instructs the user to verify the instrument residual PIM level and re-calibrate if necessary. Calibrations can be used again after settings are changed and then returned to the previous settings for which the calibration was performed.

The standard calibration calibrates Distance-to-PIM, Swept PIM, PIM vs. TIME, and Noise Floor - Time View for the current instrument settings. A user-defined calibration dialog is available allowing users to select specific calibrations they wish to perform, and this allows multiple power-level calibrations to be performed at the same time (refer to the Passive Intermodulation Analyzer Measurement Guide that is listed in Appendix A for more information).

If you are performing a Noise Floor Spectrum View measurement, a separate calibration is required. Press the Start Cal Spectrum View button in the **Noise Floor** menu, and then follow the on-screen instructions to calibrate the Spectrum View (alternately, you can use the "User Defined Calibration Dialog Box" as described previously).

These steps describe the standard calibration process:

1. Press **Shift** then **Cal** (**2**) to open the Calibration menu.

2. In the Calibration menu, press the Start Calibration submenu key.

3. If conducting a high-band intermodulation measurement (i.e., PCS, 1900 MHz, or IM2), ensure that the PIM Master receiver port is open (disconnected) and skip to Step 4. For all other bands, connect the appropriate PIM standard onto the test port of the PIM Master or at the end of the PIM test cable.

4. Connect an appropriate Low PIM Load onto the PIM Master output port or to the Low PIM standard if used.

5. Press **Enter** to calibrate or **Esc** to exit.

6. If you are conducting a high-band intermodulation measurement as noted in Step 4, skip to Step 13. During the calibration, CALIBRATION IN PROCESS... is displayed on the measurement screen in red letters, and a beep is emitted when this step is completed.

7. When prompted, remove the PIM standard and the Low PIM Load, and then connect only the Low PIM Load.

8. Press **Enter** to calibrate or **Esc** to exit.

9. If the Low PIM Load is better than –88 dBm, then the calibration continues, as in Step 10.

If the Low PIM Load just installed has high PIM, then this calibration will not be useful. If the measured PIM is worse than –88 dBm, then a warning is displayed. See Figure 3-6 on page 3-12. The displayed warning provides 3 options.

    a. Verify again After you have made corrections, press this button to continue the calibration.

    b. Bypass verification Press this button to ignore the warning and continue the calibration.

    c. Exit calibration Press this button to abort the current calibration.

10. During the calibration, CALIBRATION IN PROCESS... is displayed on the measurement screen in red letters, and a beep is emitted when this step is completed.

11. When prompted, remove all components from the test port leaving nothing connected at the point of calibration (Open circuit).

12. Press **Enter** to calibrate or **Esc** to exit.

13. During the calibration, CALIBRATION IN PROCESS... is displayed on the measurement screen in red letters. When calibration is complete, two beeps are emitted, and **Calibration On** is displayed at the bottom of the Instrument Settings Summary.

Bad Load Detection Feature

The second step of a calibration requires removal of the PIM Standard and reattachment of the Low PIM Load. If the Low PIM Load has measured PIM worse than –88 dBm, then the **WARNING: High PIM detected** dialog box is displayed (as shown in Figure 3-6).
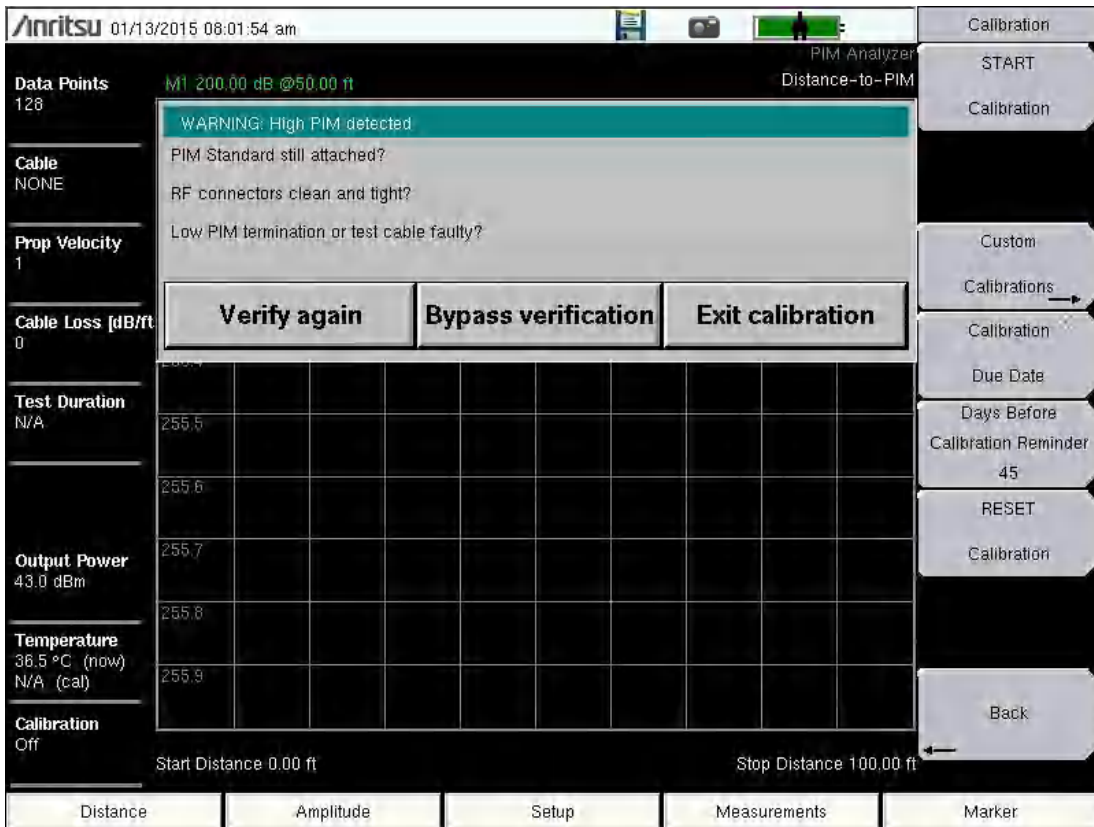
Figure 3-6.   Bad Load Detection Warning

Verifying Residual PIM

Perform this test immediately following a calibration or when instructed to do so, such as when 12 hours or more have elapsed since the existing calibration was performed. Attach the Low PIM Load to the Test Port or to the end of the PIM test cable.

1. From the Measurements menu, press the PIM vs. Time submenu key followed by the Test submenu key so that Measure is underlined.

2. Lightly tap on the Low PIM Load and flex the PIM test cable (if attached) during the PIM vs. Time test. The peak PIM value should be at least 10 dB below the pass/fail criteria for the DUT.

If the measured PIM is outside of the limit in Step 2, then you may have one of the following problems:

- Metal flakes inside one or more RF connectors
- Loose RF connector
- Faulty Low PIM Load
- Worn connector saver (refer to "Connector Saver" on page 1-5)
- Damaged PIM Test Port connector

Investigate and repair the source of any problem, and then repeat the calibration process.

Verifying the PIM Standard

1. Connect a PIM Standard to the Test Port or to the end of the PIM test cable.

2. Connect a Low PIM Load to the PIM Standard.

3. From the Measurements Menu, press the PIM vs. Time submenu key, followed by the Test submenu key so that Measure is underlined.

4. The peak PIM value for the PIM Standard that you are testing should be within ± 3 dB of the numbers shown in Table 3-1 on page 3-14. If the measured PIM is outside of the ± 3 dB limit, contact Anritsu customer service at http://www.anritsu.com/contact-us.

PIM Standards

Table 3-1 provides PIM values and frequencies for two PIM Standards. The PIM values in this table represent PIM power for typical IM3 at 2 X 20 W.

Table 3-1.   PIM Value Versus Frequency for PIM Standards – with Typical IM3 at 2 X 20 W

Option	F1 (MHz)	F2 (MHz)	IM3 (MHz)	−80 dBm at 1775 MHz PN: 1091-390-R	−80 dBm at 910 MHz PN: 1091-403-R	−80 dBm at 1730 MHz PN: 1091-446-R
600	617	640	663	−88 dBm −131 dBc	−80 dBm −123 dBc	−93 dBm −136 dBc
700 (lower)	734	757	711	−87 dBm −130 dBc	−81 dBm −124 dBc	−87 dBm −130 dBc
700 (upper)	734	757	780	−86 dBm −129 dBc	−80 dBm −123 dBc	−90 dBm −133 dBc
701, 702 (lower)	768	803	733	−87 dBm −130 dBc	−81 dBm −124 dBc	−88 dBm −131 dBc
701, 702 (upper)	768	803	838	−86 dBm −129 dBc	−80 dBm −123 dBc	−89 dBm −132 dBc
703 (lower)	734	757	711	−87 dBm −130 dBc	−81 dBm −124 dBc	−87 dBm −130 dBc
703 (upper)[a]	734	757	780	−86 dBm −129 dBc	−80 dBm −123 dBc	−90 dBm −133 dBc
850	869	894	844	−86 dBm −129 dBc	−80 dBm −123 dBc	−85 dBm −128 dBc
800	791	821	851	−86 dBm −129 dBc	−80 dBm −123 dBc	−90 dBm −133 dBc
900, 902	935	960	910	−86 dBm −129 dBc	−80 dBm −123 dBc	−85 dBm −128 dBc
180	1805	1880	1730	−80 dBm −123 dBc	−74 dBm −117 dBc	−80 dBm −123 dBc
194 (PCS/AWS)	1930	2130	1730	−80 dBm −123 dBc	−74 dBm −117 dBc	−80 dBm −123 dBc
194 (PCS)	1930	1990	1870	−78 dBm −121 dBc	−72 dBm −115 dBc	−78 dBm −121 dBc
210	2110	2170	2050	−78 dBm −121 dBc	−72 dBm −115 dBc	−77 dBm −120 dBc
260	2620	2690	2550	−75 dBm −118 dBc	NA	−73 dBm −116 dBc

a.For option 703, the upper band is available only in 1-port mode.

Note	Typical values are shown. PIM Standards can vary ± 3 dB due to manufacturing variation. Record the starting value of your PIM Standard, and use that value for test equipment verification.

Verifying the PIM Test Cable

Note	When testing, cables are connected and disconnected many times. In order to save wear on the PIM test port cables and adapters, Anritsu recommends removing the o-rings. This allows getting a sufficiently tight connection without unnecessary stress on the connectors. In the field, o-rings are important to maintain connection integrity over long time periods. Connections must be torqued to specifications in order to ensure that they prevent water intrusion. During your test, if the DUT connector has an o-ring, leave it in place and tighten to the correct torque.

If calibration was performed on the instrument test port, then you must next verify the PIM performance of the test cable.

1. Connect a test cable to the PIM Master and terminate the other end with a Low PIM Load.

2. From the Measurements Menu, press the PIM vs. Time submenu key followed by the Test submenu key so that Measure is underlined.

3. During the test, flex the test cable and verify that the PIM level of the test cable and the Low PIM Load are at least 10 dB below the pass / fail criteria for the DUT.

   If the test cable fails, inspect the connections to ensure that they are clean and tight. If poor performance persists, then repeat the calibration process.

4. If the PIM level of the setup is within specification, then disconnect the Low PIM Load and connect the test cable to the DUT for a PIM measurement.

Checking for External Interference

Before performing a PIM test on an antenna system, verify that external interference is not present at the selected IM frequency.

1. Connect a test cable from the PIM Master to the DUT.

2. Press the **Measurements** main menu key and then press Noise Floor to open the Noise Floor submenu.

3. From the Noise Floor submenu, press the Test submenu key so that Measure is underlined. This will perform a Noise Floor - Time View measurement.

4. Verify that the external noise level at the selected IM frequency is below the required system pass / fail threshold for PIM.

5. If high nose is detected, press the **Noise Floor Spectrum View** submenu key. If a calibration has not already been performed for this feature, press the **Start Cal Spectrum View** submenu key and follow the on-screen instructions.

6. Press the **Test** submenu key so that Measure is underlined. This will perform a swept noise floor measurement to help identify which frequencies in the uplink band are clear of interference. Marker 2 automatically shows the location of the current IM frequency.

Making PIM Measurements

1. Press the **Measurements** main menu key and then press one of the measurement submenu keys (PIM vs. Time or Swept PIM).

2. From the Measurements menu, press the Test submenu key so that Measure is underlined to start the test.

3. During the test, tap connectors and the antenna.

   Note: Set the test duration time so that you can tap all desired areas.

4. After the measurement is complete, press the Save Measurement submenu key, provide an appropriate name, and save the measurement. (Refer to Section 4-3 "File Management" on page 4-3.)

Note	The PIM Master continually monitors Return Loss at the two PIM test frequencies while performing a PIM test. If the Return Loss exceeds –6 dB, then the PIM test will be terminated, and this warning message appears: "Warning! High Reflection from measurement path!" If this message appears, use a DTF measurement (using Option 331 or a Site Master) to identify the location of the high reflections. An option exists to by-pass the high reflection warning and continue testing into a high return loss system. The PIM value measured may not be accurate when high reflections are present. This option should be exercised by experienced users for troubleshooting only.

Measurement Types

From the measurements menu, you can select from these four measurement types.

PIM versus Time

This measurement tracks instantaneous PIM and also records Peak PIM levels throughout a fixed frequency PIM test. It is useful for dynamic PIM tests and provides a visual indication of the stability of the system under test.

Noise Floor

Two different Noise Floor measurements are available to evaluate Rx interference sources before making a PIM measurement. For each measurement, Tx power is Off. The Time View measurement allows you to check for external interference at the IM frequency that is being measured. The Spectrum View measurement allows you to view interference levels across the current Rx frequency range.

The IM products of interest are in the same frequency range used by mobile users equipment to communicate with base stations. It is therefore possible for nearby mobile equipment to generate signals that are powerful enough to interfere with your PIM measurement. The Noise Floor measurement mode graph area displays Noise Floor Measurement message:

Figure 3-7.   Noise Floor Measurement Message

Distance-to-PIM

Distance-to-PIM (DTP) is similar to Distance-to-Fault (DTF), which Anritsu introduced in the Site Master for identifying the location of impedance mismatches in a feed line. DTP quickly and accurately identifies the location of PIM faults inside the feed system as well as beyond the antenna.

Distance-to-PIM is a swept measurement that enables identification of the location of multiple PIM sources in the RF path. Distance-to-PIM is an analysis feature only, and it should not be used as a pass / fail test.

Swept PIM

PIM measurements are the vector sum of all PIM signals that are generated on a line at the tested IM frequency. When multiple PIM sources exist, it is possible for the signals to combine out-of-phase at a particular test frequency to indicate a passing result when the individual PIM levels are actually failures. A Swept PIM test varies the IM frequency over a range of frequencies so that you get a clearer picture of the true, system PIM performance.

2-Port Measurement

Two-port measurements can be made in PIM vs Time, Distance to PIM, and Swept PIM modes. These modes display the message 2-Port Measurement in the graphing area of the screen. Refer to the PIM Analyzer Measurement Guide listed in Appendix A.

Figure 3-8.   2-Port Measurement Mode Message

Adding a Limit Line

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.

Note	The upper limit must be On in order to use the Limit Alarm or the Pass Indicator.

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

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

5. Press the Amplitude submenu key to set the Limit value.

6. Press the Limit Alarm submenu key to toggle the alarm setting On and Off. The current setting is underlined.

Although the instantaneous PIM values may be displayed in white numerals at the end of a measurement, if the measured PIM value exceeded the upper limit setting at any time during the measurement, then the Peak PIM values will remain displayed with red numerals when the measurement is complete.

3-5   Setting Up Markers

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

Selecting, Activating, and Placing a Marker

1. Press the Marker 1 2 3 4 5 6 submenu key and then select the desired marker using the touch screen marker buttons. The selected marker is underlined on the Marker submenu key.

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

3. Use the arrow keys to place the marker on the desired frequency. You can also move a marker on the touch screen.

4. Repeat Step 1 through Step 3 to activate and move additional markers.

Selecting, Activating, and Placing a Delta Marker:

1. Press the Marker 1 2 3 4 5 6 submenu key and select the desired marker (to become a delta marker). The selected marker is underlined.

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

3. Use the arrow keys to place the delta marker on the desired frequency.

4. Repeat Step 1 through Step 3 to activate and move additional delta markers.

Viewing Marker Data in a Table Format

1. Press the More submenu key.

2. Press the Marker Table On Off submenu key so that On is underlined. All marker and delta marker data are displayed in a table under the measurement graph.

3-6   Saving Measurements

1. Press the Save Measurement submenu key.

2. Press the Change Save Location submenu key and set the current location to be the USB flash drive or internal memory, and then press Set Location.

3. Press Change Type (Setup/JPG/…) and select Measurement from the Select File Type list.

4. Press the JPEG Capture submenu key (to select Full or Graph Only), if desired.

5. Press **Enter**.

6. Enter the file name using the touch keyboard (and Quick Name Matrix, if desired)

7. Press **Enter** (touch screen or hard key).

Note	After the Save Location and File Type are changed, these settings will remain in effect until manually changed again.

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

Chapter 4 — File Management

4-1   Introduction

This chapter describes the file management features of the PIM Master and the file management menus. The submenus under the **File** menu allow you to save, recall, copy, and delete files in the internal memory or in an external USB flash drive. Files can also be managed using an external PC running Line Sweep Tools (LST).

4-2   Managing Files

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

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

File Types

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

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

- ALL (displays all file types)
- Setup, `*.stp`

  (Setup files contain basic instrument information, measurement mode setup details (including calibration data), measurement marker data, and limit data.)

- PIM Measurement, `*.pim`

  (Measurement files contain all of the measurement data and all of the information in the setup files.)

- JPEG, `*.jpg`
- Limit Lines, `*.lim`

  (The Limit line file contains limit line data details. The Limit function is available only in PIM versus Time and Swept PIM measurements.)

- C&AA Measurement (with Option 331), `*.dat and *.vna`

Note	Traces saved as DAT can be viewed, edited, and analyzed with Handheld Software Tools. If the DUAL measurement display is turned on, then files are saved as Filename and Filename_2. All data point formats are supported by the DAT file format, but LST must be used to open DAT files with 1102 data points or 2204 data points. Only with LST are Smith Chart and 1-Port Phase measurements supported with DAT file format. DAT and VNA files can be recalled only in C&AA mode, except for DTF-RL measurements, which can be viewed in PIM DTP mode with the Load DTF Trace command.

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

File types `*.map` and `*.kml` (for two-dimensional and three-dimensional map functions) are not use by the PIM Master.

4-3 File Management

You can Save, Recall, Copy, and Delete files, starting from the File menu.

Saving Files

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

Set the Save Location

Press the Save submenu key then the Change Save Location key and select the location to save files (refer to "Save Location Menu" on page 4-14). You can save files to the internal memory or to an external USB flash drive. You can also create new folders. If an external USB flash drive is connected or disconnected, press Refresh Directories to update the location tree. Press the Set Location submenu key to store the save location.

Save a Measurement As

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

Save a Measurement

Press the Save Measurement submenu key and enter the name for the measurement file. The file type defaults to measurement, and the appropriate extension is added based on the current measurement mode. For more information about file types, refer to "File Types" on page 4-2. Saving and recalling measurements provides a convenient reference for comparing site conditions at subsequent visits.

Save a Setup

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

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

Saving and recalling setups allows you to run the same tests again and again at different sites.

Create a Menu Shortcut for a Setup file

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

Save a Measurement Screen as JPEG

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

Save Dialog Box

The save dialog box (Figure 4-1) is used to store files on the internal memory or on an external flash drive. The file type, filename, and save location are set at this display. Refer to "Save Menu" on page 4-13 and "Save Location Menu" on page 4-14 for details.
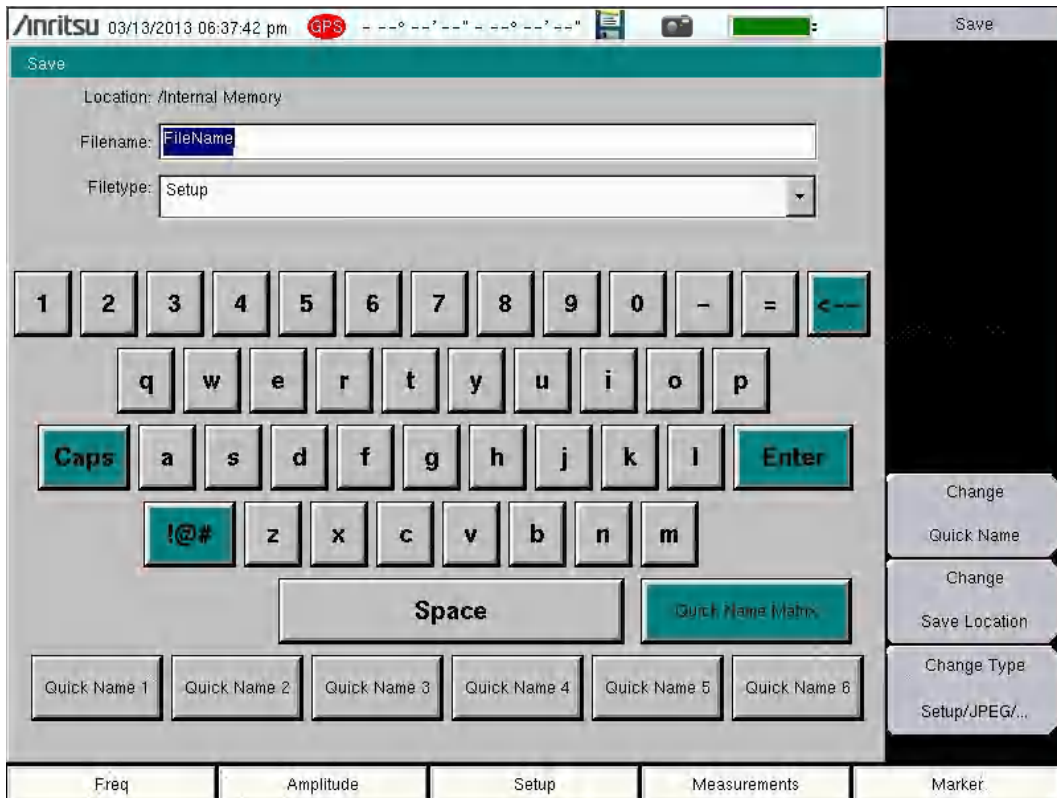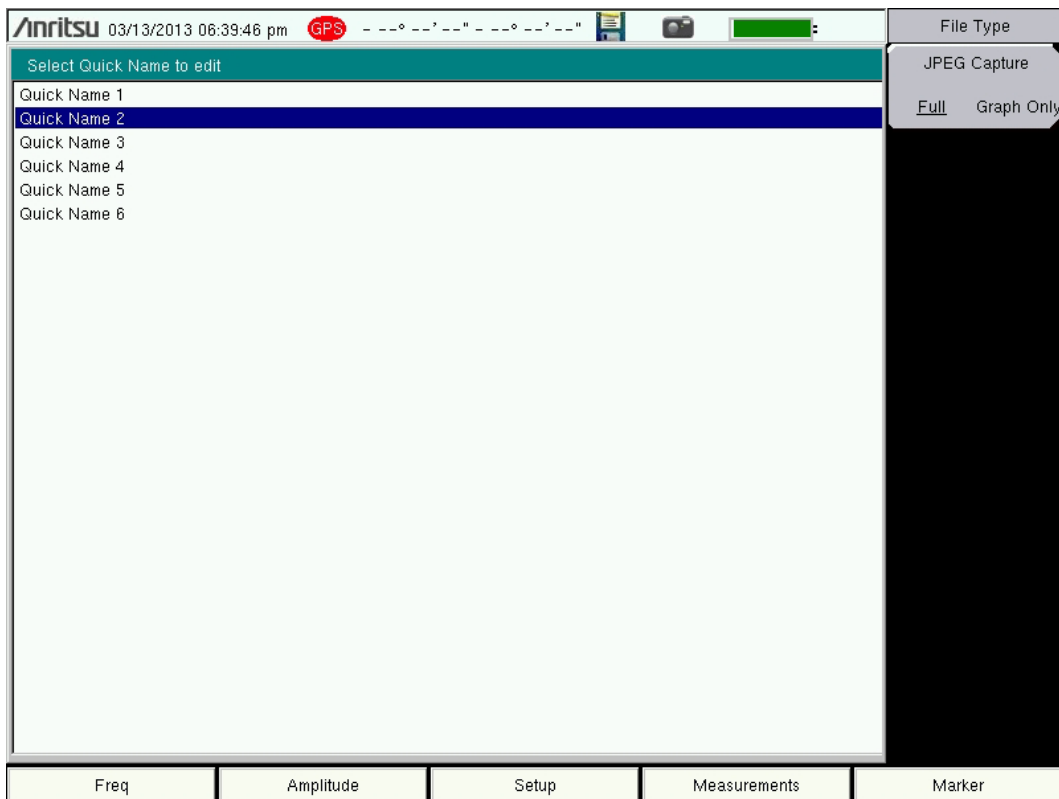

Figure 4-1.   Save Dialog Box

Quick Name Keys

Quick Name keys, displayed below the keyboard in Figure 4-1, allow you to enter quick names or name parts for frequently used file names.

Editing Quick Names

To edit the keys, press the **Shift** key, then the **File** (**7**) key. Press Save, then press the Change Quick Name key. Select one of the Quick Names for editing, press **Enter**, and type in the new name for the key. This is the text that will be inserted into the Filename edit box. Press **Enter** again and the new name is displayed on the key.

Figure 4-2.   Select Quick Name Dialog Box

Using the Quick Name Matrix

From the Save dialog box (Figure 4-1 on page 4-4), press the Quick Name Matrix key (to the right of the Space key) to display the Quick Name Matrix dialog box.
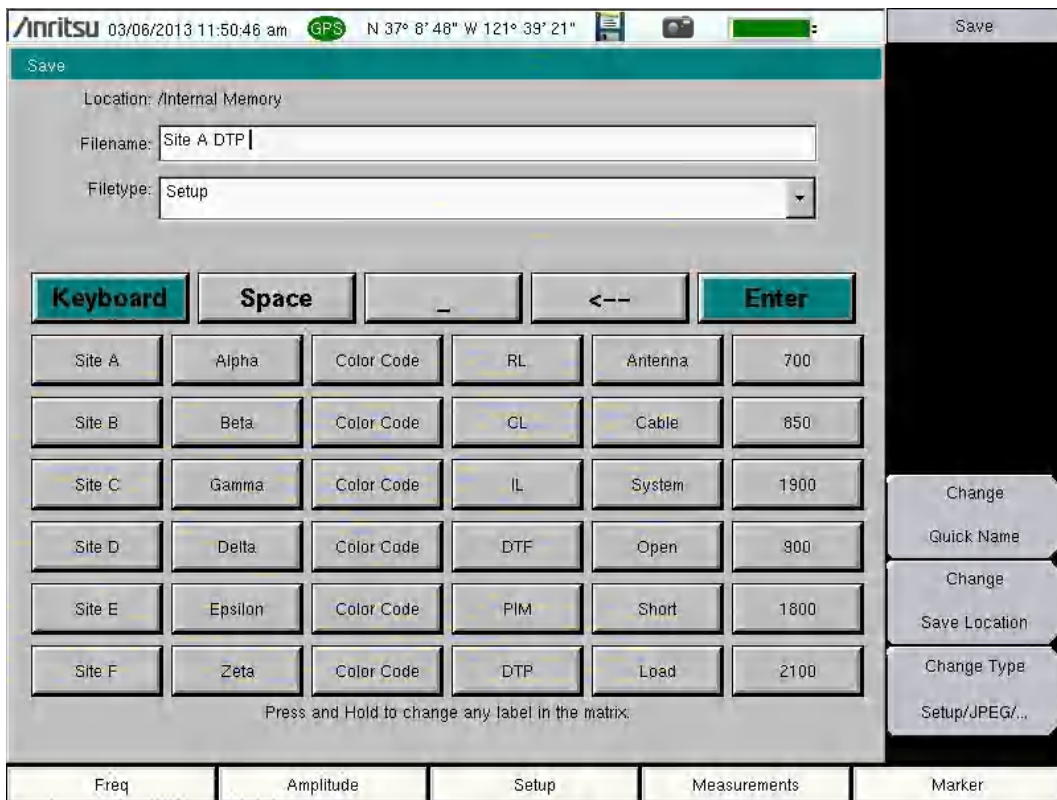
Figure 4-3.   Quick Name Matrix Dialog Box

Press any key in the matrix to add text to the Filename. As noted under the matrix of keys, you can press and hold a key to change its text, which is shown on its label. The maximum numbers of characters is 18 per key. When the filename is complete, press the **Enter** key (either in the Matrix or above the number keypad).

To return to the Save keyboard, press the Keyboard key in the top row. You can then continue typing in the filename edit box. You can use the instrument **Left** and **Right Arrow** keys (above the number keypad) to scroll through the filename for editing.

Note	Entries that you make for the Quick Name Matrix and Quick Name keys can be saved and recalled by using Setup files.

Recalling Files

The recall menu enables you to view all the Measurement and Setup files in the internal memory and the external USB flash drive.

You can sort files in the recall menu by name, date, or type. You can also choose to view only measurement files or only setup files by pressing File Type on the Recall dialog box and by selecting the file type that you want to view. For more information about file types, refer to "File Types" on page 4-2.

Recall a PIM Measurement

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

Recall a PIM Setup

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

Recall Dialog Box

The Recall dialog box (Figure 4-4) allows you to open previously saved measurements and setups. Refer to the "Recall Menu" on page 4-17 for additional information.
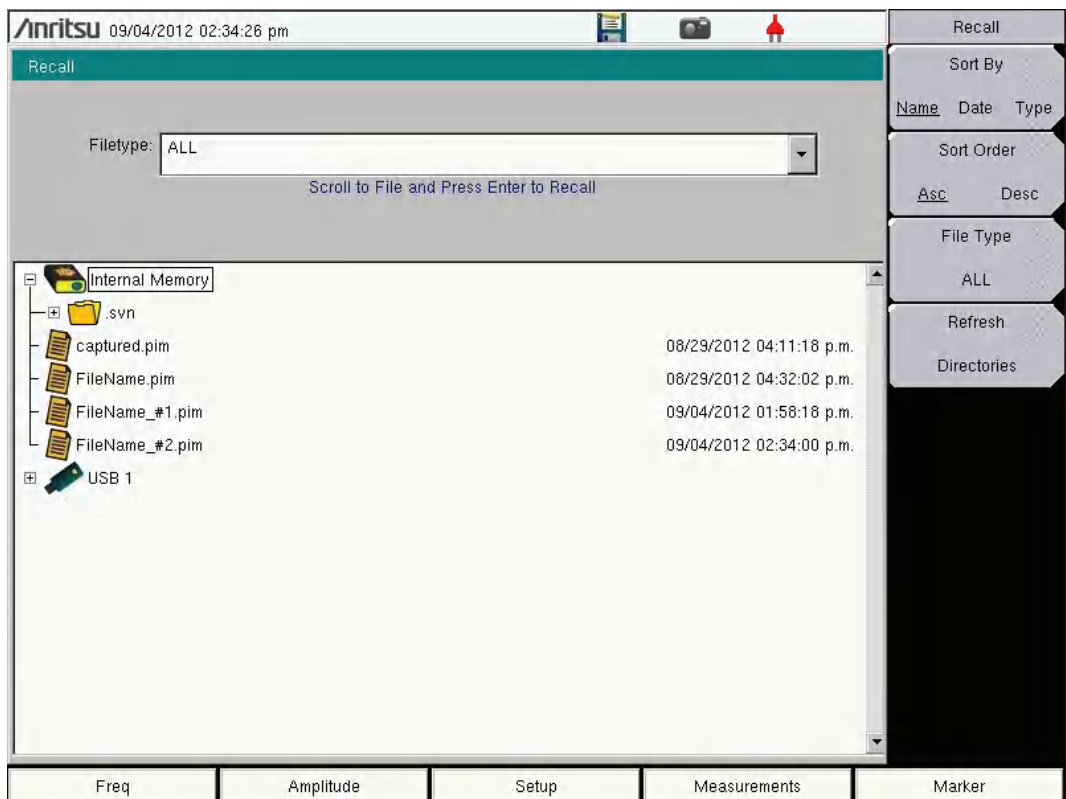
Figure 4-4.   Recall Dialog Box

Copying Files

The steps below describe copying a file from internal memory to an external USB flash drive. Select the files to be copied in the top window and select the destination for the files in the bottom window (Figure 4-5). Refer to the "Copy Menu" on page 4-19 for additional information.

1. Insert a USB drive into either of the USB Type A ports of the PIM Master.

2. From the **File** main menu, press the Copy submenu key. The Copy submenu and Copy dialog box are displayed.

3. Select the files to be copied. To select multiple files, highlight the first file, then press the Select or De-Select key to keep the desired files selected. A selected file will be outlined in blue. Repeat with all the files to be copied. To display files in a folder, select the folder and press the **Enter** key.

4. Press the Scroll submenu key and highlight the USB drive in the lower window by using the touch screen or the **Up/Down** arrow keys. The Scroll submenu key toggles between Src (source, top window) and Dst (destination, bottom window).

   To choose a subdirectory on a USB drive as the save destination, select the desired USB drive (with **Arrow** keys or with the touch screen) and press the **Enter** key to see available subdirectories. When a directory or subdirectory is highlighted, subdirectories can be displayed or closed by pressing the **Right** and **Left** arrow keys.

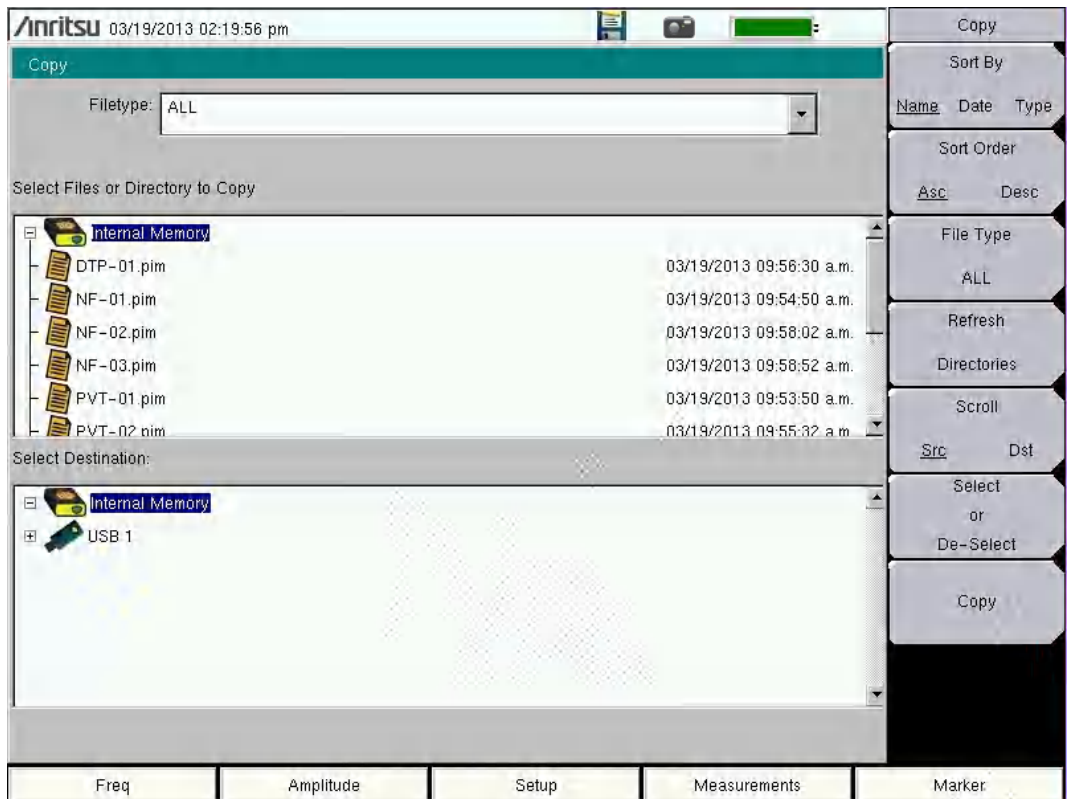**5.** Press the Copy key to copy the files to the flash drive.

Figure 4-5.   Copy Dialog Box

| **Note**	Use the **Left/Right** arrow keys to Collapse/Expand folders.

Deleting Files

Delete a Selected File or Files

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

Delete Dialog Box

Press the Delete submenu key to open the Delete dialog box (Figure 4-6). The submenus allow sorting files by type, name, and saved date. Refer to the "Delete Menu" on page 4-21 for additional information.
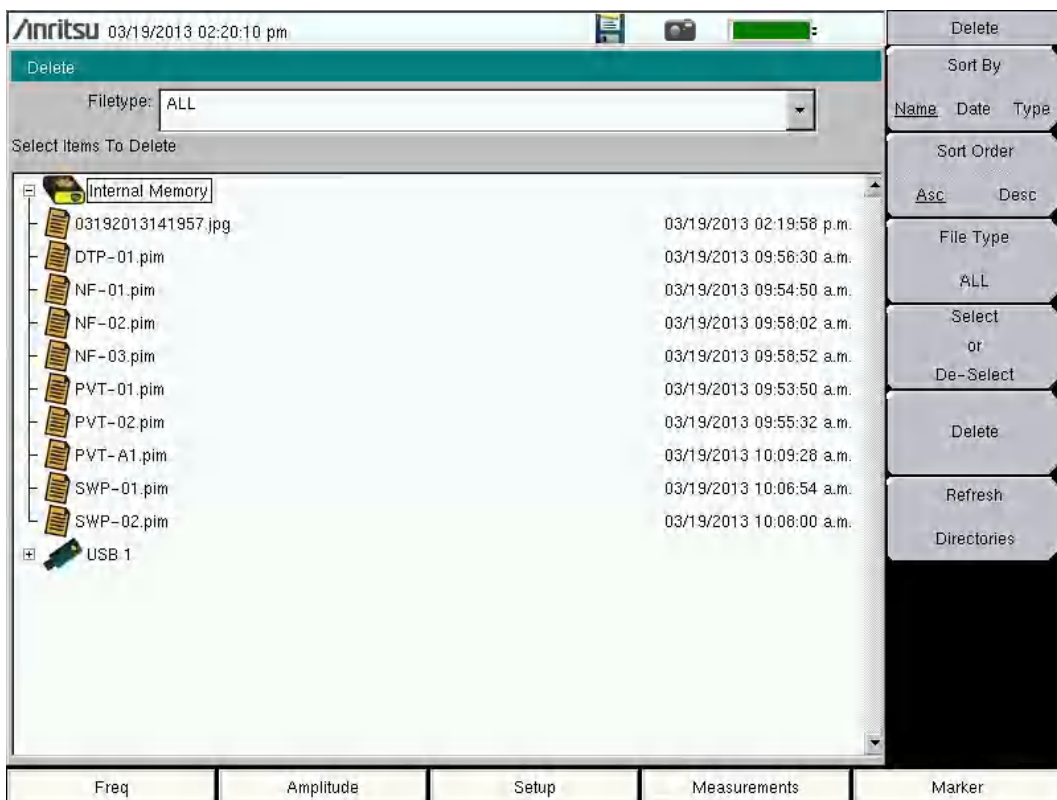
Figure 4-6. Delete Dialog Box

4-4   File Menu Overview

Open the File menu by pressing the **Shift** key, then the **File** (**7**) key. Menu maps typically display all possible submenu keys, although some keys are displayed on the instrument only under special circumstances (refer to menu descriptions on the following pages).
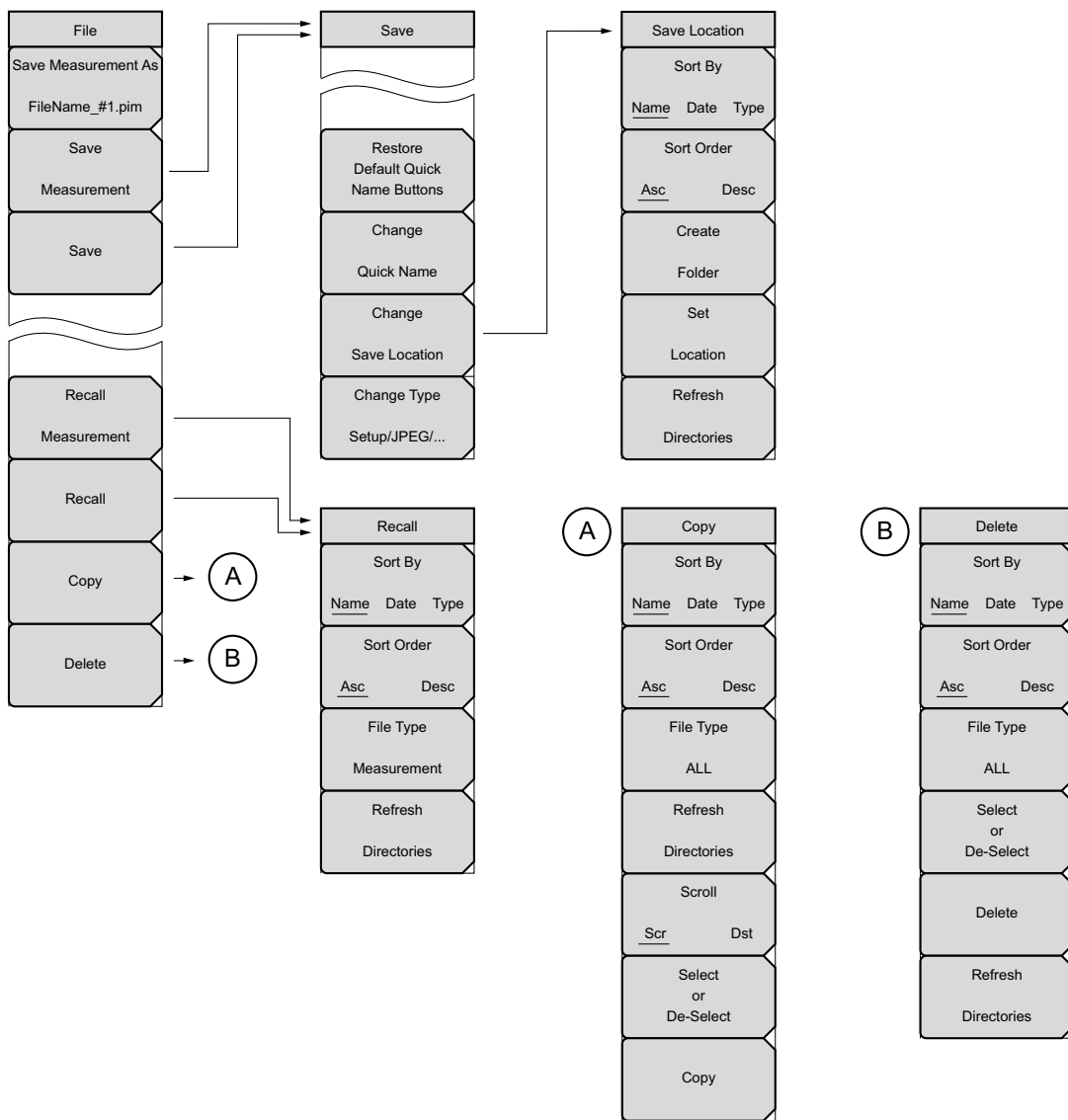
Figure 4-7.   File Menu Overview
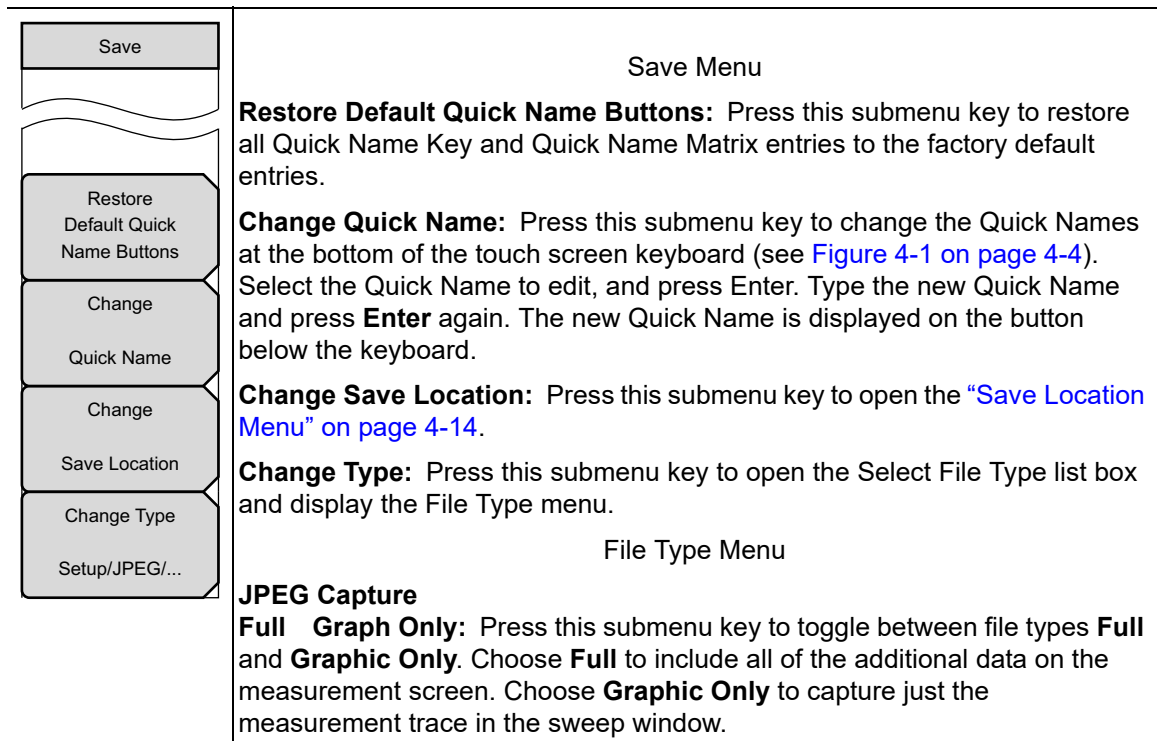
4-5   File Menu

Key Sequence: **File**

File Save Measurement As FileName_#1.pim Save Measurement Save Recall Measurement Recall Copy Delete	**Save Measurement As:** Press this key to save the current setup with a user-defined filename. The default filename is changed using the Save submenu. To change the default filename, press the Save Measurement submenu key to open the Save dialog box. Enter the new measurement filename with the letter keys. Refer to "Save Menu" on page 4-13. Press **Enter** to save the name and return to the File menu. The Save Measurement As submenu key displays the new entered name appended with `_#1.pim.` After a few seconds, the screen returns to the File menu. Press the Save Measurement As key again, and the new filename will be used. Each press of this submenu key saves the current measurement with the same base filename while incrementing the final number. Measurement file names have a `.pim` extension. **Save Measurement:** Press this submenu key to display the "Save Menu" and the Save dialog box (see Figure 4-1 on page 4-4). Measurements can be saved to internal memory or to a USB flash drive. The saved measurement can be named using the text entry keys in the dialog box. By default, measurements are saved to internal memory in a directory named `/user`. The save destination is set with the "Save Location Menu" on page 4-14. **Save:** Press this submenu key to display the "Save Menu" on page 4-13. Measurements can be saved to internal memory or to a USB flash drive. The saved setup, measurement, or JPEG file can be named by using the text entry keys in the dialog box. By default, measurements are saved to internal memory in a directory named `/user`. The save destination is set with the "Save Location Menu" on page 4-14. **Recall Measurement:** Press this submenu key to display the "Recall Menu" on page 4-17. This menu is for recalling measurements from internal memory or from a USB flash drive. **Recall:** Press this submenu key to display the "Recall Menu" on page 4-17. This menu is for recalling measurements or setup data from internal memory or from a USB flash drive. **Copy:** Press this submenu key to display the "Copy Menu" on page 4-19. This submenu is for copying files or folders to and from internal memory and a USB flash drive. **Delete:** Press this submenu key to display the "Delete Menu" on page 4-21 and a selection box that shows the setup and measurement names, the file type, and the date and time that the information was saved. Use the **Up/Down** arrow keys or the touch screen to highlight the file that is to be deleted and press the Delete submenu key, then confirm your selection by pressing Yes or No in the dialog box. Press the **Esc** key at any time to cancel the operation. Note that deleted files cannot be recovered.

Figure 4-8.   File Menu

Caution	Deleted files cannot be recovered.

4-6   Save Menu

Key Sequence: **File** > Save

	Save Menu
Save	**Restore Default Quick Name Buttons:** Press this submenu key to restore all Quick Name Key and Quick Name Matrix entries to the factory default entries.
Restore Default Quick Name Buttons	**Change Quick Name:** Press this submenu key to change the Quick Names at the bottom of the touch screen keyboard (see Figure 4-1 on page 4-4). Select the Quick Name to edit, and press Enter. Type the new Quick Name and press **Enter** again. The new Quick Name is displayed on the button below the keyboard.
Change Quick Name	**Change Save Location:** Press this submenu key to open the "Save Location Menu" on page 4-14.
Change Save Location	**Change Type:** Press this submenu key to open the Select File Type list box and display the File Type menu.
Change Type	File Type Menu
Setup/JPEG/...	**JPEG Capture** **Full Graph Only:** Press this submenu key to toggle between file types **Full** and **Graphic Only**. Choose **Full** to include all of the additional data on the measurement screen. Choose **Graphic Only** to capture just the measurement trace in the sweep window.

Figure 4-9.   Save Menu

4-7   Save Location Menu

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

This menu and dialog box (Figure 4-11 on page 4-15) are used to create folders and to select the location that the PIM Master will use to save the current file. Select folders or drives with the **Up/Down** arrow keys or the touch screen.

Note	Only folders (not files) are visible in the Save Location dialog box. To view files, use the "Save Menu" on page 4-13 or the "Recall Menu" on page 4-17.

Sort By
Name   Date   Type: Press this submenu key to sort the folders by Name, Date, or Type.

Sort Order
Asc   Desc: Display the folder names in ascending or descending order.

Create Folder: Press this submenu key to create a new folder in the highlighted location or folder. The create directory dialog box is displayed for naming the folder. See Figure 4-12 on page 4-16.

Set Location: Press this submenu key to set the current location for saving files and to return to the "Save Menu" on page 4-13.

Refresh Directories: Press this submenu key to update the display.

Figure 4-10. Save Location Menu

Select Save Location Dialog Box
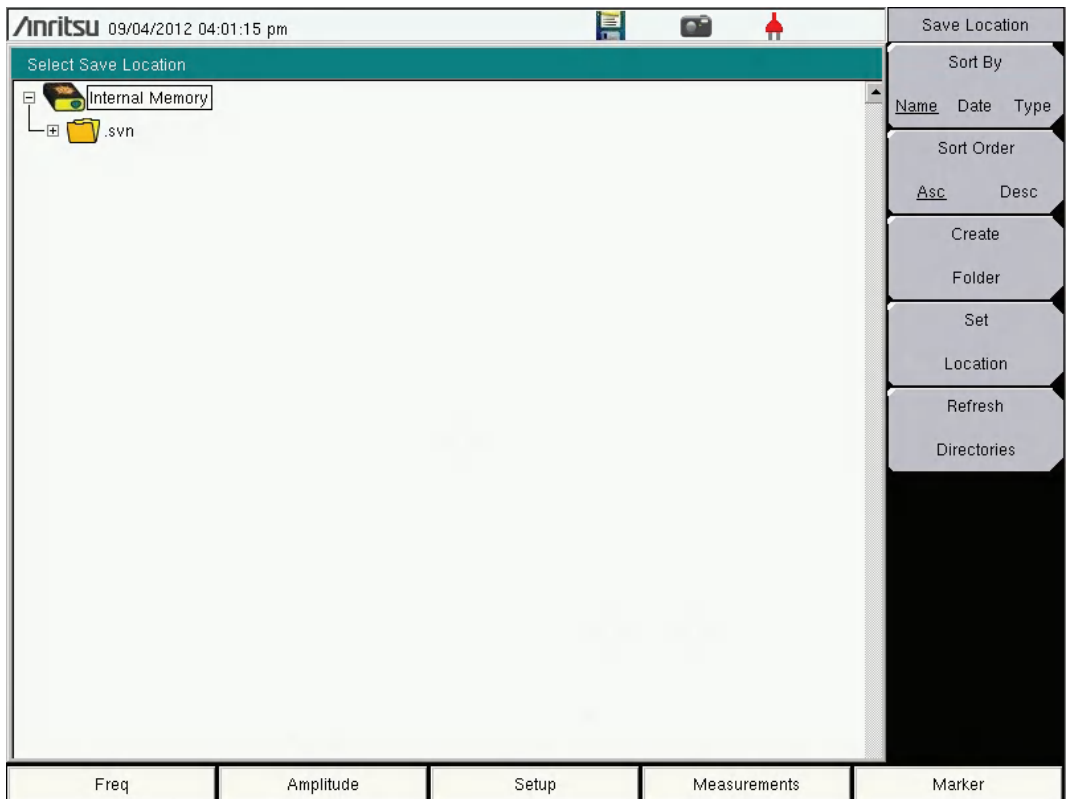
Figure 4-11. Select Save Location Dialog Box

Create Directory Dialog Box
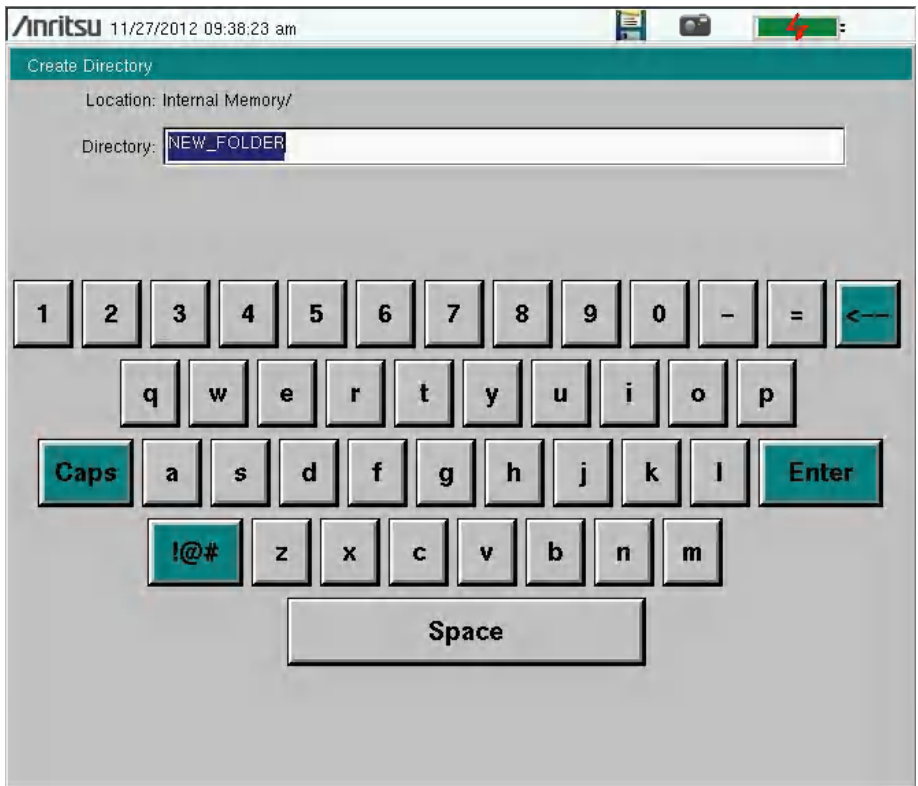
Figure 4-12. Create Directory Dialog Box

4-8   Recall Menu

This menu and the dialog box shown in Figure 4-14 on page 4-18 are used to navigate folders and select files to be recalled to the PIM Master. Select folders or files with the **Up/Down** arrow keys or the touch screen.

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

Recall
 	
Sort By
 	
Name Date Type
 	
Sort Order
 	
Asc   Desc
 	
File Type
 	
ALL
 	
Refresh
 	
Directories
	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.
	
	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 By
	Name Date Type: Press this submenu key to sort file and folders by the file name, by the date that the file or folder was saved, or by the type of file.
	
	Sort Order
	Asc Desc: Press this submenu key to display the folders or files in ascending or descending order based on the selection in the Sort By key.
	
	File Type: Press this submenu key to open the Select File Type list box and select the type of file to be viewed. The file type can be changed with the **Up/Down** arrow keys. Press **Enter** to make the selection. Some examples of file types are:
	
	   Setup: Setup files contain basic instrument information, measurement mode setup details, measurement marker data, and limit data.
	
	   Measurement: Measurement files contain all of the information in the setup files and the measurement data.
	
	   Limit Lines (`.lim`): The Limit line file contains limit line data details. (The Limit function is available only in PIM versus Time and Swept PIM measurements.)
	
	   ALL: Displays all file types.
	
	For more information about file types, refer to "File Types" on page 4-2.
	
	Refresh Directories: Press this submenu key to update the display.

Figure 4-13. Recall Menu

File Types in the list box include Map, KML 2D, and KML 3D, which are not use by the PIM Master.

Recall Dialog Box

Select folders or files with the **Up/Down** arrow keys or the touch screen.
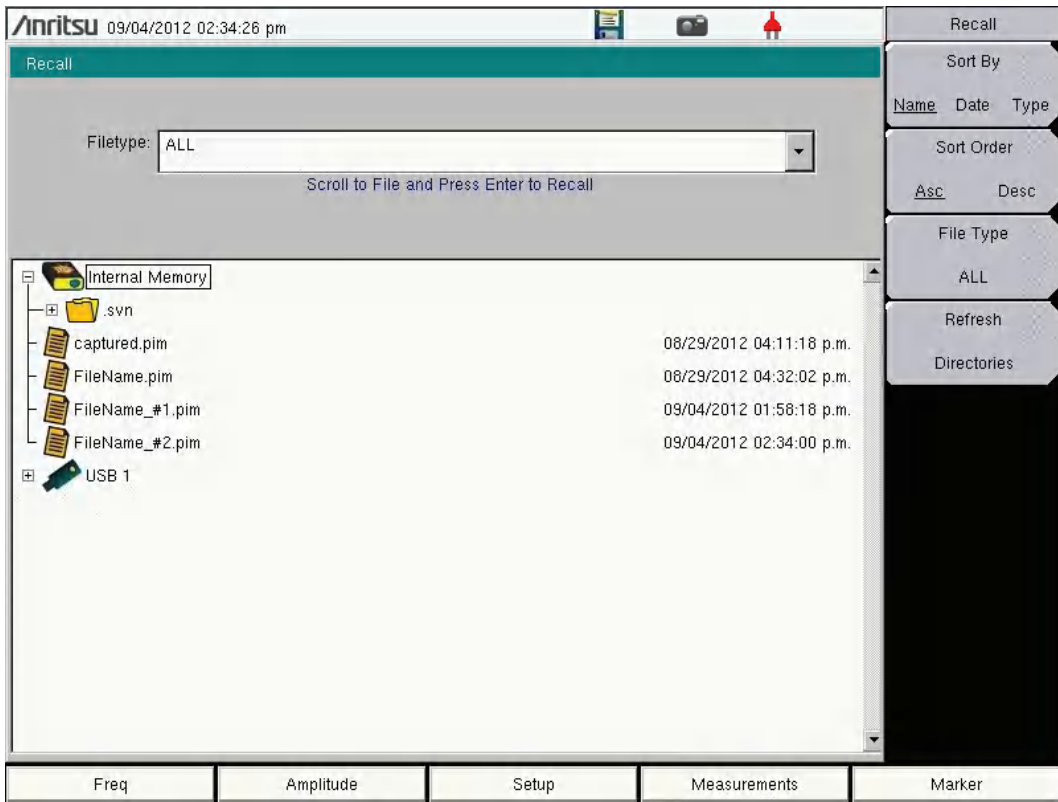
Figure 4-14. Recall Dialog Box

4-9   Copy Menu

This menu and dialog box are used to copy folders and files. Select folders or files with the **Up/Down** arrow keys or the touch screen. Figure 4-16 on page 4-20 shows the Copy dialog box with two JPEG images selected and ready to be copied to the USB flash drive. Highlight a folder and then press either **Enter** or the **Right** arrow key to view the contents.

Key Sequence: **File** > Copy

Copy Sort By Name Date Type Sort Order Asc Desc File Type ALL Refresh Directories Scroll Scr Dst Select or De-Select Copy	**Sort By** **Name Date Type:** Press this submenu key to sort file and folder lists by name, by type of file, or by the date that the file was saved. **Sort Order** **Asc Desc:** Press this submenu key to display the folders or files in ascending (**Asc**) or descending (**Desc**) order based on the selection in the **Sort By** key. **File Type:** Press this submenu key to select the type of files to view for copying. The file type can be changed with the **Up/Down** arrow keys or by using the touch screen. Press **Enter** to make the selection. For more information about file types, refer to "File Types" on page 4-2. **Refresh Directories:** Press this key to update the display. **Scroll** **Src Dst:** Press this submenu key to use the scroll function in either the Source Window (**Scr** - top pane) or the Destination Window (**Dst** - bottom pane). See Figure 4-16. **Select or De-Select:** Use this key to select or deselect the files or folders to be copied. When selected, a file or folder is highlighted in blue (see Figure 4-16). **Copy:** Press this submenu key to copy the files or folders that are selected in the top pane to the destination that is selected in the bottom pane. A dialog box is displayed when the copy function is complete. If a file with the same name exists in the destination folder, then a warning box is displayed to allow file overwrite or to allow cancel.

Figure 4-15. Copy Menu

Copy Dialog Box
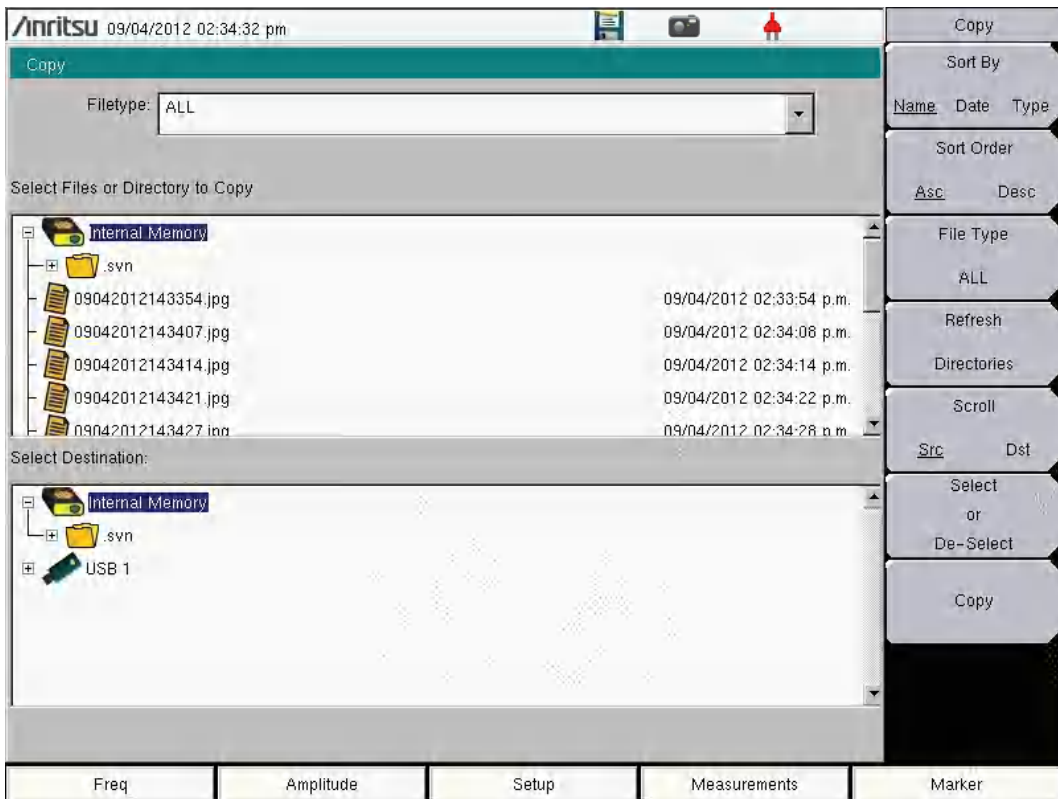
Figure 4-16. Copy Dialog Box

4-10   Delete Menu

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

Delete Sort By <u>Name</u> Date Type Sort Order <u>Asc</u> Desc File Type ALL Select or De-Select Delete Refresh Directories	This menu and dialog box is used to delete folders and files. Select folders or files with the **Up/Down** arrow keys. **Sort By** **Name Date Type:** Press this submenu key to sort files and folders by name, by the type of file, or by the date that the file or folder was saved. **Sort Order** **Asc Desc:** Displays the folder or file in ascending or descending order based on the selection in the Sort By key. **File Type:** Press this submenu key to select what type of file view for deleting. The options are ALL, Measurement, Setup, Limit Lines, or JPEG. The file type can be changed with the **Up/Down** arrow keys. Press **Enter** to make the selection. For more information about file types, refer to "File Types" on page 4-2. **Select or De-Select:** Use this key to select or deselect the file(s) or folder(s) to be deleted. When selected, a file or folder will be outlined in blue. **Delete:** Press this key to open the Delete dialog box (Figure 4-16 on page 4-20). Press **Enter** to delete the selected item or **Esc** to Cancel. **Refresh Directories:** Press this key to update the display.

Figure 4-17. Delete Menu

See Figure 4-6 on page 4-10 for an illustration of the Delete dialog box.

Chapter 5 — System Operation

5-1 Introduction

This chapter describes PIM Master system operations. Other menus are described in the PIM analyzer measurement chapters.

5-2 System Menu Overview

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

System Menu Map

Menu maps typically display all possible submenu keys, although some keys are displayed on the instrument only under special circumstances (refer to menu descriptions on the following pages).
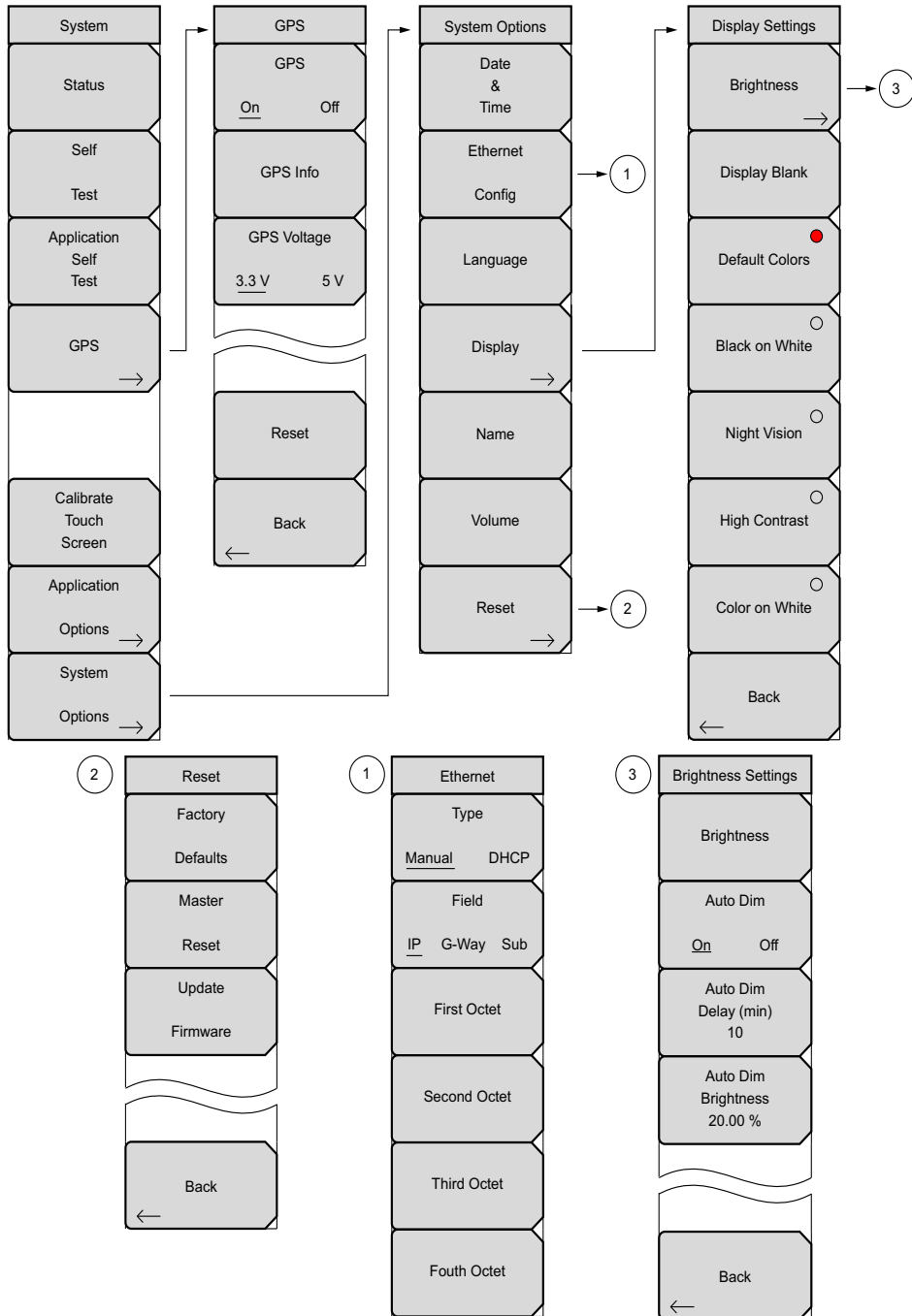
Figure 5-1.   System Menu Map

5-3   System Menu

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

System Status Self Test Application Self Test GPS $\longrightarrow$ Calibrate Touch Screen Application Options $\longrightarrow$ System Options $\longrightarrow$	**Status:** Press this submenu key to display the current system status, including the operating system and firmware versions, temperatures, and other details such as current battery information. Press **Esc** or **Enter** to return to normal operation. **Self Test:** Press this submenu key to run a series of tests that are related to the performance of the motherboard hardware. Press the **Esc** key to abort, or press the **Enter** key to continue. The display lists a summary of those tests that have passed. If any test fails, then all of the performed tests are listed with Pass/Fail notification. If the Self Test fails when the battery is fully charged and the instrument is within the specified operating temperature, contact your Anritsu Service Center (refer to "Contacting Anritsu for Sales and Service" on page 1-2) and report the test results. Press **Esc** or **Enter** to return to normal operation. **Application Self Test:** Press this submenu key to run a series of tests that are related to the performance of the instrument hardware and that are specific to the current instrument application (refer to Section 2-10 "Mode Selector Menu" on page 2-20). Press the **Esc** key to abort, or press the **Enter** key to continue. The display lists a summary of those tests that have passed. If any test fails, then all of the performed tests are listed with Pass/Fail notification. If any test fails, contact your Anritsu Service Center and report the test results. Some of the hardware that is tested may also be used in different operating modes. One or more additional submenu keys may be displayed to allow running additional application self tests. **GPS:** Press this submenu key to open the GPS Menu. Refer to Chapter 6, "GPS (Option 31)" for additional information. This submenu key is displayed only when Option 31 is installed. **Calibrate Touch Screen:** Press this submenu key to begin touch screen calibration. Additional details and related features are described in Section 2-13 "Touch Screen Calibration" on page 2-25. **Application Options:** Submenu keys are specific to each measurement mode. No menu options are available for PIM Analyzer modes. For other modes, please refer to a specific Measurement Guide, as listed in Appendix A. **System Options:** Press this submenu key to open the "System Options Menu" on page 5-4.

Figure 5-2.   System Menu

System Options Menu

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

System Options Date & Time Ethernet Config Language Display → Name Volume Reset →	**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 to select the date and time. Press **Enter** to accept the changes, or press the **Esc** key to return to normal operation without changing anything. **Ethernet Config:** Press this submenu key to display the Ethernet submenu and to open the Ethernet Editor dialog box to set the IP address of the instrument. For details, refer to section "Ethernet Configuration" on page F-1 in Appendix F, "LAN and DHCP". **Language:** Press this submenu key to open a list box and select a built-in language for the PIM Master displays. The languages that are currently available are: English, French, German, Spanish, Japanese, Chinese, Korean, Italian, and Russian. In addition, a custom language may be selected if it has been defined by using Line Sweep Tools and loaded into the PIM Master. Two custom languages may be loaded into the instrument via Line Sweep Tools. If a mode does not have language translations available, then English is the default language. Press **Enter** to accept the change, or press the **Esc** key to return to normal operation without changes. In addition, any existing language (except English) may be edited for a better local translation. **Caution:** A reset will overwrite any custom settings within the PIM Master and will require that you reload the custom language files via Line Sweep Tools. **Display:** The Display submenu key opens the "Display Settings Menu" on page 5-5 allowing brightness control and the selection of different display attributes. **Name:** Press this submenu key to open a dialog box to name the instrument. The PIM Master can be named by using the text entry keys, which are similar to those shown in Figure 4-1 on page 4-4. Press **Enter** to save the name. **Volume:** Press this submenu key to set the speaker volume. The current volume setting is displayed on the screen. Use the keypad, the **Up/Down** arrow keys to change the volume, and press the **Enter** key to accept the change. **Reset:** Press this submenu key to open the "Reset Menu" on page 5-7.

Figure 5-3.   System Options Menu

Display Settings Menu

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

---

Display Settings

Brightness
→

Display Blank

● Default Colors

○ Black on White

○ Night Vision

○ High Contrast

○ Color on White

Back
←

Brightness: Press this submenu key to display the "Brightness Settings Menu" on page 5-6.

Display Blank: Opens a note box. Press **Enter** to turn off the display, or press **Esc** to abort. When the display is off, turn on the display with three rapid key presses of any key except the power key (or turn instrument power Off and On).

Default Colors: Sets the display colors to their factory default condition and is used for normal viewing. The measurement grid is black (or a shade of gray), and the background is black.

Black on White: Sets the display colors to black (data) and white (background). This setting is used for printing and viewing in broad daylight conditions.

Night Vision: Sets the display to a red-tinted color (data) with a black background. Optimized for night-time viewing.

High Contrast: Increases the black and white contrast of the default display. This setting is used for challenging viewing conditions.

Color on White: Sets the display background to white, the grid to gray, and leaves sweep data in color. This setting is used for printing and viewing in broad daylight conditions.

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

Figure 5-4.   Display Settings Menu

Brightness Settings Menu

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

Brightness Settings Brightness Auto Dim On Off Auto Dim Delay (min) 10 Auto Dim Brightness 20.00 % Back ←	**Brightness:** The brightness of the display can be adjusted to optimize viewing under a wide variety of lighting conditions. Use the **Up/Down** arrow keys (increment changes of 25), the **Left/Right** arrow keys (0 or 100) to select a brightness level from 0 to 100, with 100 being the brightest. Press **Enter** to accept the change. All of the visible display options are affected by the Brightness setting. **Auto DIM** **On Off:** In order to extend battery life, the PIM Master can be configured to automatically dim the screen to a lower brightness setting after a specified amount of inactive time. Setting Auto DIM to ON enables this feature, and setting Auto DIM to OFF disables this feature. The Auto DIM feature is also disabled while the PIM Master is connected to a DC power source. To revive the screen to the default brightness setting, touch the screen or press any number key. **Auto Dim Delay (min):** Sets the amount of time to wait after the last screen touch or number key entry before dimming the screen. This value can be set to whole minutes between 1 minute and 15 minutes. **Auto DIM Brightness:** Sets the brightness level to which the instrument can dim (0 % to 25 %). The lower the brightness level, the more the gain in battery life. **Back:** Press this submenu key to return to the "System Options Menu" on page 5-4.

Figure 5-5.   Display Settings Menu

Reset Menu

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

Reset Factory Defaults Master Reset Update Firmware Back ←	**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. User calibrations are not affected by this operation (see Master Reset). The instrument will power cycle when the operation is complete. Press the **Enter** key to initiate the reset, or press **Esc** to abort. **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, including user calibrations. The instrument will power cycle when the operation is complete. Press **Enter** to initiate the reset, or press **Esc** to abort. **Update Firmware:** Press this submenu key to update the instrument operating system using an external USB drive. Press **Enter** to begin the update, or press **Esc** to return to normal operation without updating. Refer to Section E-5 "PIM Master Firmware Update" on page E-6 for additional information. **Back:** Press this submenu key to return to the "System Options Menu" on page 5-4.

Figure 5-6.   Reset Menu

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

5-4   Preset Menu

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

Preset Preset Save Setup Recall Setup	**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. User calibrations are not affected by this operation (see Master Reset). **Save Setup:** Opens the Save dialog box to name and save the current operating settings, allowing them to be recalled later to return the instrument to the state it was in at the time the setup was saved. **Recall Setup:** This key allows the selection and recall of a previously stored instrument setup. All current instrument settings are replaced by the stored setup information.

Figure 5-7.   Preset Menu

5-5   Self Test

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

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

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

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

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

3. Press the **Esc** key to continue.

Also refer to **Self Test** and **Application Self Test** in the .

Chapter 6 — GPS (Option 31)

6-1   Introduction

The PIM Master MW82119B is available with a built-in GPS receiver feature (Option 31) that can provide latitude, longitude, altitude, and UTC timing information. When GPS is actively locked to satellites, this information is saved with all saved measurements and can be displayed with Line Sweep Tools.

6-2   Setting Up GPS (Option 31)

In order to acquire data from the GPS satellites, you must have line-of-sight to the satellites, or the antenna must be placed outside without any obstructions. In addition to having Option 31 installed, the PIM Master requires a GPS antenna.

Anritsu GPS antenna part numbers:

- 2000-1528-R (with 15-foot cable)
- 2000-1652-R (with 1-foot cable)
- 2000-1760-R (no cable)

Activating the GPS Feature

1. Attach the GPS antenna to the GPS Antenna connector in the side connector panel (see Figure 2-8 on page 2-11).

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

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

4. Activate GPS by pressing the GPS, On/Off submenu key so that On is underlined. When GPS is first turned On, the GPS icon is displayed in red to indicate that less than 3 satellites are currently being tracked.

Figure 6-1.   GPS Icon, Red

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

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

6. When the GPS receiver is tracking at least 3 satellites, the GPS icon changes to green.

Figure 6-2.   GPS Icon, Green

Note	To reset the GPS, press the Reset submenu key. The green GPS icon with a red cross appears when GPS satellite tracking is lost (see Figure 6-3).

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

6-3   GPS Menu

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

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

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

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

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

Back: Press this key to return to the "System Menu" on page 5-3.

Figure 6-4.   GPS Menu

GPS Info

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

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

Altitude: Shows altitude information in meters.

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

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

Antenna Status: OK and Short/Open

- **OK:**   Antenna is connected properly and is working properly.

- **Short/Open:**   A short or open exists between the antenna and the connection. If this message is displayed, then remove and reconnect the GPS antenna. If the message persists, then try another Anritsu GPS antenna. If the message persists, contact your nearest Anritsu Service Center (refer to "Contacting Anritsu for Sales and Service" on page 1-2).

Receiver Status: Current status of the receiver.

GPS Antenna Voltage and Current: Shows voltage and current.

Chapter 7 — Anritsu Tool Box with LST

7-1 Introduction

This chapter provides a brief overview of the Anritsu Tool Box and the Line Sweep Tools (LST) program. For detailed information about Line Sweep Tools, refer to the program Help.

7-2 Anritsu Tool Box

The Anritsu Tool Box is a central location to open an Anritsu measurement, visit the Anritsu web site, or launch an Anritsu application. The Tool Box contains software tools including a Line Sweep Tools program and other PC Tools for Anritsu Handheld RF Instruments.

The Tool Box installer is available for download from the Anritsu web site at:

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

7-3 Install the Software

Run the Tool Box installer from the Downloads folder (if you just performed the download), and follow the on-screen instructions (Figure 7-1). The screens shown below are for illustration purposes only and may vary with the installer version.

Note	The figures in this user guide are provided as examples. They may not match your images.

Figure 7-1. Anritsu Software Tool Box Setup Wizard

The Setup Wizard lets you choose which software Tool Box component to install. By default, all available Tool Box applications are selected. See Figure 7-2.
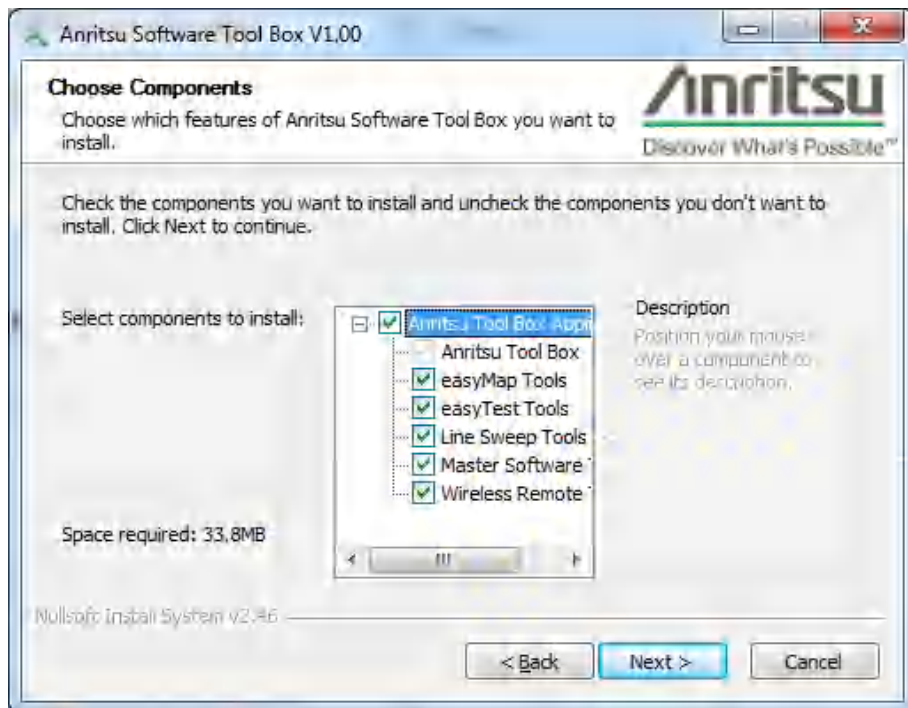
Figure 7-2.   Select Tool Box Components to Install

After the Anritsu Tool Box has been installed on the PC, either click on the shortcut icon on the desktop or click Start and navigate through the Programs folder to the Anritsu folder. Then click on the Anritsu Tool Box shortcut to open the Anritsu Tool Box. After the Tool Box is open, move the mouse pointer over any of the application icons to view a short description of the application.

7-4   Line Sweep Tools

Line Sweep Tools is a program designed to increase productivity for people who work with dozens of Cable traces, Antenna traces, and Passive Intermodulation (PIM) traces every day.

Why use Line Sweep Tools?

Line Sweep Tools can:

- Collect sweeps from Anritsu PIM and Line Sweep gear.
- Help verify that those sweeps are done properly and that the Cable, Antenna, and PIM sweeps meet specifications.
- Help create reports of the findings, quickly and to a professional standard.

Line Sweep Tools Features

The Line Sweep Tools user interface is familiar to users of Hand Held Software Tools, the current industry standard line sweep post-capture trace processing software. This leads to a short learning curve and easy trace collection, validation, and reporting.

The Anritsu Line Sweep Tools program includes:

- Presets for markers and limit lines, which take hours off the report preparation time for a user with dozens of traces to verify.
- The Report Generator, which makes generating PDF reports for multiple traces, with logos, quick and easy.
- Dual Trace viewing mode, which ensures compatibility with the E series line sweep instruments and with the PIM Master.
- A naming grid, which makes naming files, titles, and subtitles much quicker and error free.
- Line Sweep Tools can open DAT or VNA files from a wide range of current and supported Anritsu handheld instruments.
- Line Sweep Tools can open the PIM files generated by Passive Inter-Modulation measurements.

Using Line Sweep Tools

Like its predecessor, Hand Held Software Tools (HHST), Line Sweep Tools is intuitive for most users. However, unlike HHST, Line Sweep Tools has the capability to work rapidly with a large number of traces.

Figure 7-3.   Line Sweep Tools Window

Line Sweep Tools can open DAT files from HHST or VNA/DAT files from Anritsu instruments. It also can open PIM files. Files (after opening) can be inspected and modified in many different ways. Line Sweep Tools saves files as a new type of DAT file, and can export traces as VNA, text, JPG, BMP, or PNG. Line Sweep Tools produces files that can be opened by HHST.

Note	Power meter mode (`*.pm` files) are **not** supported by LST.

Markers and Limit Lines

The easiest way to manage markers is to turn one on and use the mouse to drag it to the desired position. The marker tool bar is shown in Figure 7-4. Markers number 2 and number 8 are On in the figure. Markers can be set to an exact value by pressing the "e" button, which displays detailed marker controls, numeric value entry, peak find, and valley find.

Figure 7-4.   Marker and Limit Tool Bar

The dark button on the right turns on the limit line. When On, it can be dragged to the desired location, or placed at an exact amplitude value by entering a number.

Marker Presets

The fastest way to manage markers on multiple traces is to use the preset function. The marker and limit line preset tool bar allows users to quickly set all markers and the limit line to pre-defined values on similar traces (Figure 7-5).

Figure 7-5.   Preset Tool Bar

First set the markers and limit lines on a typical trace to the desired values. Then, press the red "**e**" (edit) button on the Preset Tool Bar. This puts the preset buttons into "learn" mode. Next, press a preset button (1 through 7). This programs the preset button where to put the markers and limit lines. Finally, press the red "**e**" button again to exit the learn mode.

The programmed button is now enabled. Line Sweep Tools can program up to 7 buttons with preset markers and limit line.

To use the preset, just press it, and the markers and limit line are displayed at the programmed locations even when switching to a new trace. The two arrow keys make going to the next or previous trace simple. Using presets, a dozen similar traces can be reliably validated in seconds.

Naming Grid

The naming grid allows you to quickly and consistently name files, trace titles, and trace subtitles. The grid can be set up with custom phrases to make the naming process simpler.
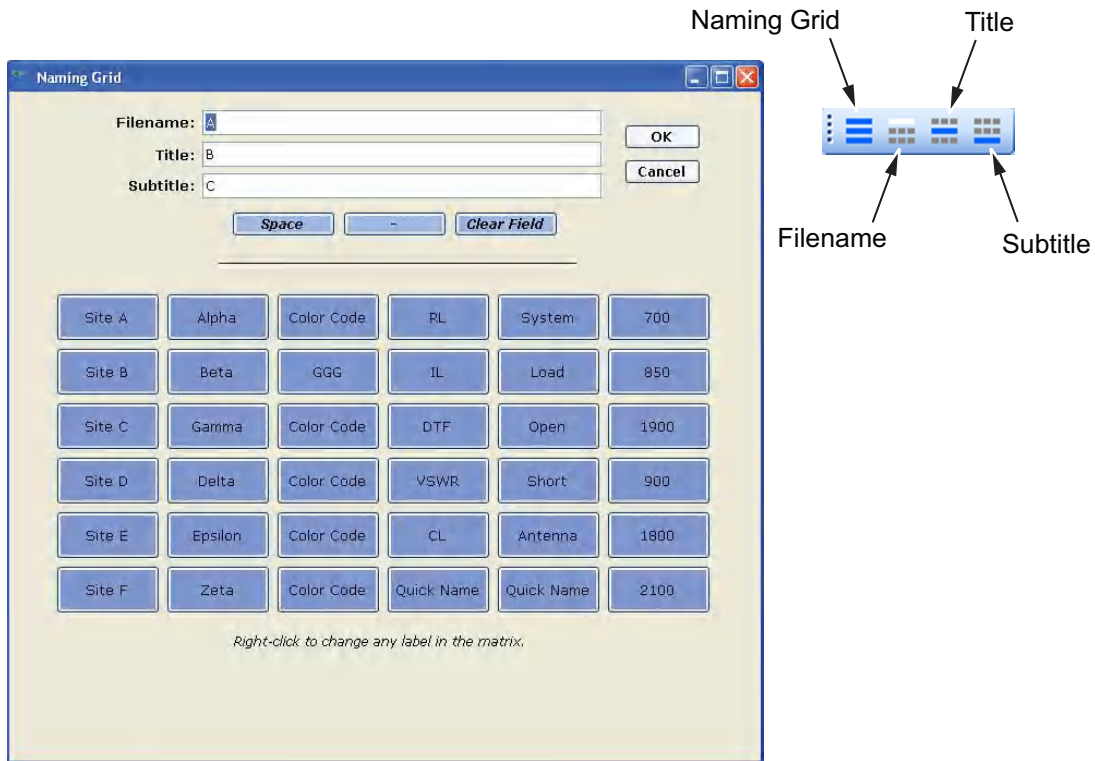
Figure 7-6.   Naming Grid and Naming Grid Tool Bar

To use the naming grid:

1. Click on the left icon of the Naming Grid Tool Bar.

2. Place the cursor in the desired entry window – Filename, Title, or Subtitle.

3. Make an entry by typing the name on the keyboard or by pressing the preset label buttons. All button entries are appended to the name in the current entry window. Press the Clear Field button to clear any entries and start over.

Note	Right-click on a matrix label to change the text on the button.

4. After completing entries, press OK to close the naming grid.

5. Click on the icons shown in Figure 7-6 to apply the new title, subtitle, filename, or combination (when using Save As) to the current trace.

6. If desired, use the arrow keys on the Marker Preset Tool Bar to go to the next trace.

Report Generator

To use the report generator in Line Sweep Tools, go to File menu and select Report Setup to determine how you want the report to appear. In the example in Figure 7-7, the report is set up to include the name of the contractor that did the work (Company field), the company for which the report is prepared, and the testing location. The report will be generated in PDF output format.
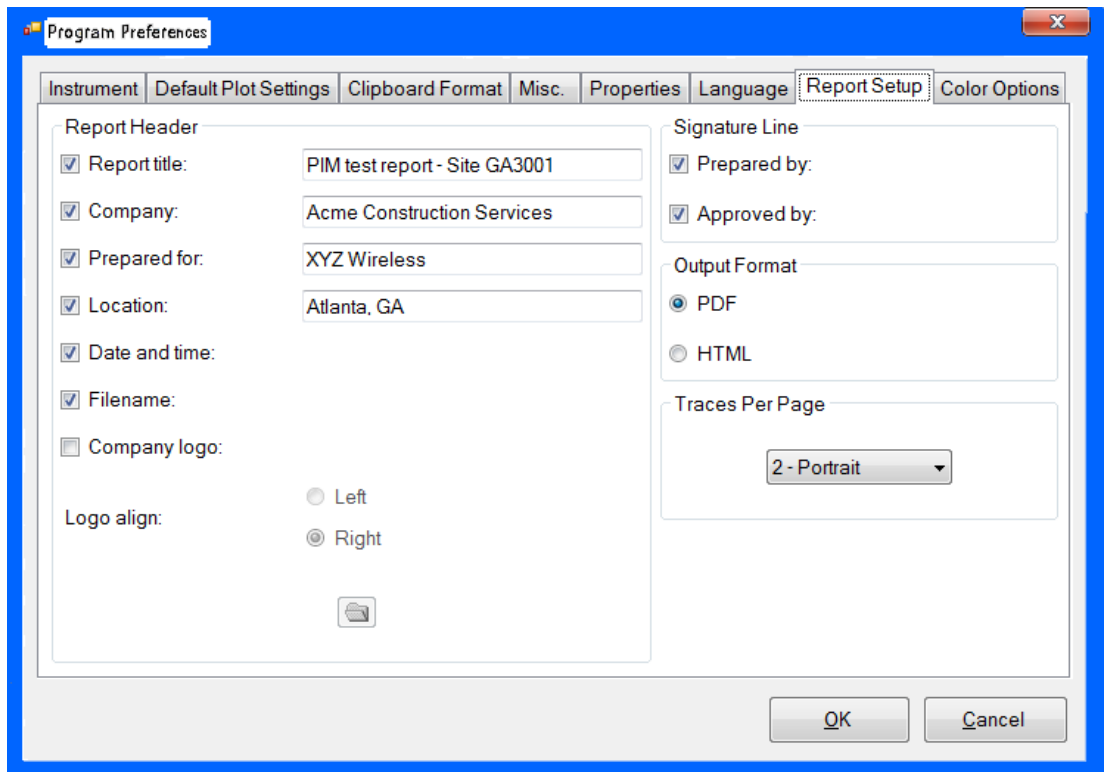
Figure 7-7.   Report Setup Tab

When the report generator is set up, File > Generate Report creates the output PDF. The report will include all traces that were open (in LST) at the time the report was made.

The following sections describe graphical and tabular report options.

Graphical Line Sweep Reports

Figure 7-8 illustrates graphical line sweep reports.
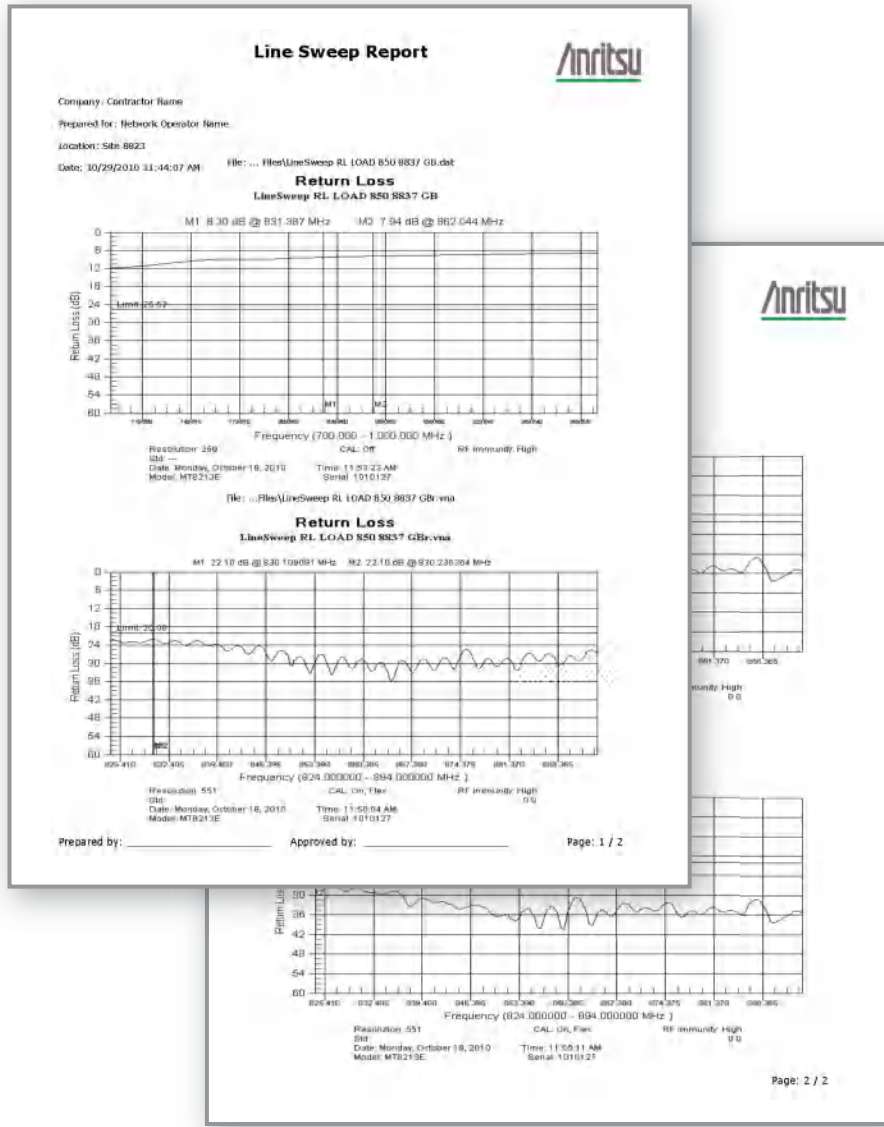
Figure 7-8.   Generated Line Sweep Reports

Graphical PIM Reports

For PIM reports that include PIM vs. Time, Noise Floor, Distance to PIM, and Swept PIM, use the LST standard report generator.

    1. Open all of the measurements that are intended to be in the report.

Note	Open these measurements files in the order in which you want them to appear in the report.

    2. Adjust limit lines, scale, markers, and titles as desired.

    3. Go to File > Report Setup to specify the desired appearance of the report (See Figure 7-7 on page 7-7). Select the desired report header fields, the signature line options, the output format, and the number of traces to appear on each page. Then select OK.

    4. Go to File > Generate Report to create the output report. A window opens to provide you with the opportunity to name the report and to choose the save location. Then select Save.

See Figure 7-9 on page 7-10 for an example report.

Figure 7-9 illustrates a graphical PIM report.
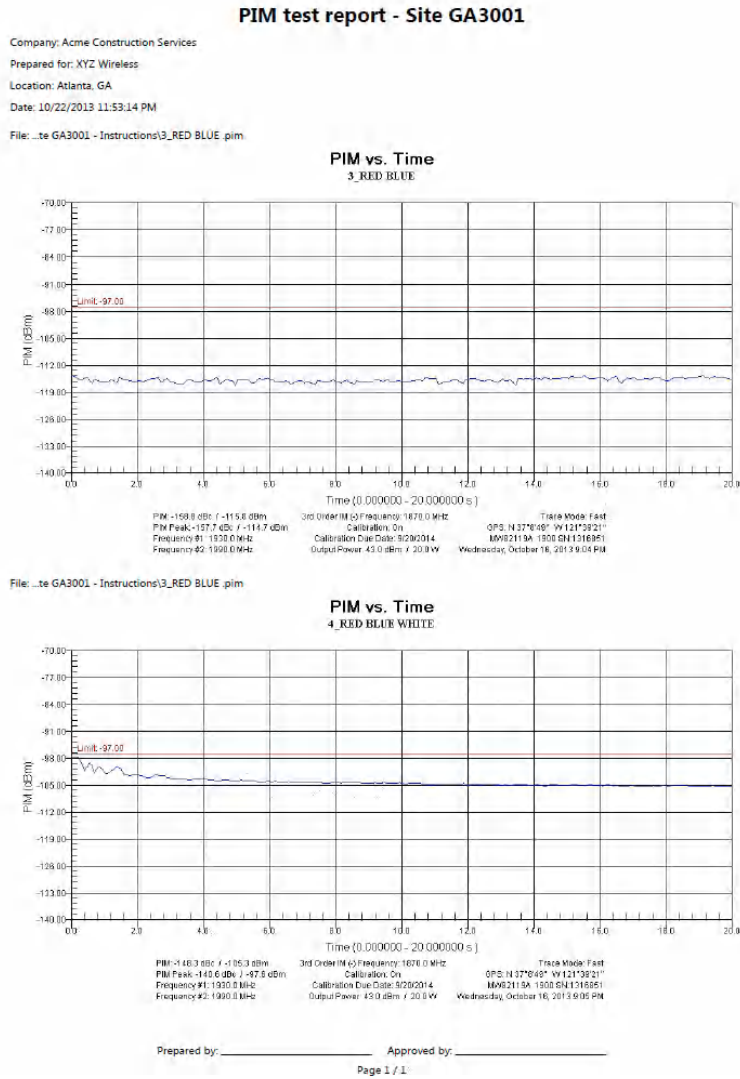
Figure 7-9. Generated Graphical PIM Sweep Report

Tabular PIM Reports

You can generate a summary Pass/Fail PIM report in tabular format using the LST PIM Report Creator Feature. This report compares the peak PIM values to the limit setting for each PIM vs. Time measurement, and produces a Pass/Fail result.

Note	Only PIM vs. Time measurements that are OPEN will appear in this tabular PIM Report.
	Other PIM measurements and C&AA measurements will **not** appear in this tabular PIM report.

1. Open all of the PIM vs. Time measurements that you intended to have in the report.

Note	Measurements will appear alphabetically in the report based on the subtitle field. Adjust this field as desired on each measurement to change the report order.

2. Adjust limit lines, scale, markers, and titles as desired.

Go to File > Reporting > PIM Report Creator (see Figure 7-10) to populate the report header fields and to select the report measurement units (dBm or dBc). Then select OK.
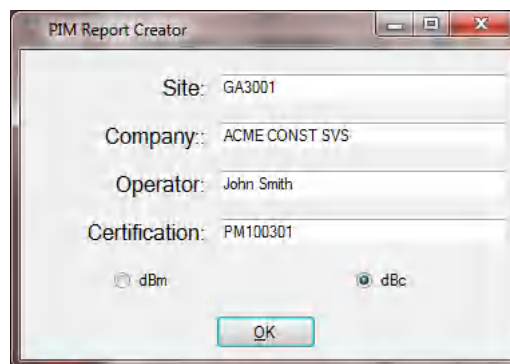
Figure 7-10. LST PIM Report Creator

3. A window opens to provide you with the opportunity to name the report and to specify the save location. Select Save. See Figure 7-11 on page 7-12 for a report example.

Figure 7-11 illustrates a tabular PIM sweep report.

Passive Intermodulation (PIM) Test Report

ACME CONST SVS

Site Details

Site	Operator	Certification
GA3001	John Smith	PM100301

Test Parameters

Tone 1 Frequency (MHz)	Tone 2 Frequency (MHz)	IM3 Frequency (MHz)
1930	1990	1870

Test Results

Test Point Description	Time	GPS	Power (dBm)	Limit (dBc)	PIM (dBc)	PIM Peak (dBc)	Result
1_LOW PIM LOAD	10/16/2013 9:02 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-175.7	-168.4	Pass
2_PIM STANDARD	10/16/2013 9:16 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-121.7	-121.7	Fail
3_RED BLUE	10/16/2013 9:04 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-158.8	-157.7	Pass
4_RED BLUE WHITE	10/16/2013 9:05 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-148.3	-140.6	Pass
5_RED GRAY	10/16/2013 9:06 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-146.8	-140.8	Pass
6_RED GRAY WHITE	10/16/2013 9:07 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-160.3	-159.0	Pass
7_BLUE BLUE	10/16/2013 9:09 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-146.9	-143.0	Pass
8_BLUE BLUE WHITE	10/16/2013 9:09 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-145.4	-142.0	Pass
9_BLUE GRAY	10/16/2013 9:10 PM	N 37°8'49" W 121°39'21"	43.0	-140.0	-156.6	-151.7	Pass

/Anritsu Discover What's Possible™

Test Set Model	Serial Number	Calibration Due	Software Version
MW82119A_190	1316851	9/20/2014	V1.14

/Anritsu Discover What's Possible™

Figure 7-11. Generated Tabular PIM Sweep Report

Appendix A — Other Documents

A-1 Introduction

This appendix provides a list of supplemental documentation for PIM Master features and options. These measurement guides are available as PDF files and as free downloads from the Anritsu Web site. To determine the PIM Analyzer firmware version in your instrument, refer to the submenu key description for "Status" on page 5-3.

PIM Master Options

Table A-1. Options

PIM Master Feature (Option)	Related Document (Part Number)
High-Accuracy Power Meter (Option 19)	Power Meter Measurement Guide (10580-00240)
GPS (Option 31)	Chapter 6 in this document
Cable and Antenna Analyzer (Option 331)	Cable and Antenna Analyzer Measurement Guide (10580-00241)

Related Documents

Table A-2. Related Documents

Document Description	Part Number
Product Information, Compliance, and Safety Notices	10100-00065
PIM Master Product Brochure	11410-00824
Performance Specifications PIM Master Technical Data Sheet	11410-00821
Passive Intermodulation Analyzer Measurement Guide	10580-00402
PIM Master MW82119B Programming Manual	10580-00403
PIM Master MW82119B Maintenance Manual	10580-00401
Configuring the Anritsu PIM Master for Wireless Browser Control	11410-00784
Site Master User Guide	10580-00252

Appendix B — PIM Carrier Bands

B-1   Introduction

PIM tests are conducted by transmitting two test signals, F1 and F2, into the system under test and then measuring intermodulation products created by those test signals that fall within the receive band of the system. The PIM Master transmit signals are user adjustable within the range shown in Table B-1.

B-2   PIM Master Carrier Bands

Table B-1.   PIM Master Carrier Bands and Frequencies

Carrier Band	Frequency Range		Option Number	Rx Frequency Range, MHz
	F1	**F2**		
LTE 600 MHz	617 MHz to 618 MHz	633 MHz to 652 MHz	MW82119B-0600	663 to 698 1867 to 1888
LTE 700 MHz	731 MHz to 734.5 MHz	746 MHz to 768 MHz	MW82119B-0700	698 to 717 777 to 806
APT 700 MHz	758 MHz to 776 MHz	788 MHz to 803 MHz	MW82119B-0701	710 to 748 825 to 845
APT 700 MHz	768 MHz to 776 MHz	788 MHz to 807 MHz	MW82119B-0702	713 to 748 825 to 845
LTE 700 MHz	731 MHz to 734.5 MHz	746 MHz to 768 MHz	MW82119B-0703	698 to 717 777 to 806
LTE 800 MHz	791 MHz to 795 MHz	811.5 MHz to 821 MHz	MW82119B-0800	832 to 862
Cellular 850 MHz	869 MHz to 871 MHz	881.5 MHz to 894 MHz	MW82119B-0850	824 to 849
E-GSM 900 MHz	925 MHz to 937.5 MHz	951.5 MHz to 960 MHz	MW82119B-0900	880 to 915
E-GSM 900 MHz	925 MHz to 937.5 MHz	951.5 MHz to 960 MHz	MW82119B-0902	885 to 915 1877 to 1920

Table B-1.   PIM Master Carrier Bands and Frequencies

Carrier Band	Frequency Range		Option Number	Rx Frequency Range, MHz
	F1	F2		
DCS 1800 MHz	1805 MHz to 1837 MHz	1857.5 MHz to 1880 MHz	MW82119B-0180	1710 to 1785
PCS 1900 MHz	1930 MHz to 1945 MHz	1965 MHz to 1995 MHz	MW82119B-0194	1850 to 1910
PCS/AWS 1900/2100 MHz	1930 MHz to 1945 MHz	2110 MHz to 2155 MHz	MW82119B-0194	1710 to 1755
UMTS 2100 MHz	2110 MHz to 2112.5 MHz	2130 MHz to 2170 MHz	MW82119B-0210	1920 to 1980 (IM7) 2050 to 2090 (IM3)
LTE 2600 MHz	2620 MHz to 2630 MHz	2650 MHz to 2690 MHz	MW82119B-0260	2500 to 2570

Appendix C — Wireless Remote Control

C-1   Introduction

The MW82119B PIM Master and a ZyXEL MWR102 (or equivalent) Portable Router can be used to remotely control your PIM test equipment from the bottom of a cellular tower using a Wi-Fi link. The control software is served by the PIM Master, and this allows you to remotely control the PIM Master from any Wi-Fi enabled device using web browser software (Chrome or Firefox preferred). This includes a wide range of tablets and smart phones running Android or iOS operating systems as well as the traditional Linux and Windows laptop and desktop computers.

C-2   Portable Router for Wireless Access

An Application Note in the PIM Library on the Anritsu Web site provides details regarding the equipment needed, the wireless router connection information, and the details for controlling your PIM Master remotely.

The Application Note title is "Configuring the Anritsu PIM Master for Wireless Browser Control" (refer to Appendix A, "Other Documents").

Remote Control Option
for Tower-Top Testing

Figure C-1.   Controlling the PIM Master Using a Tablet Computer

The control software is served by the PIM Master, so the existing browser software on your own computing device can be used to control the PIM Master from a remote location.

C-3 Configuring the PIM Master for Wireless Browser Control

Wi-Fi links are useful in the field, particularly when the PIM Master is on a tower, and you are on the ground. For wireless browser control, the PIM Master requires firmware version v1.15 or later. Firmware may be downloaded from the Anritsu Web site by following the links for "Downloads and Software" and "Handheld RF Firmware Updates".

C-4 Using a ZyXEL MWR102 Travel Router

The ZyXEL MWR102 Travel Router is one of many suitable travel routers. All that you need to wirelessly connect to your analyzer is included with the router. This includes an Ethernet cable, a USB cable (for powering the MWR102), and instructions for use.

This router comes pre-programmed with a password for accessing the device. This password can be found on a sticker placed on the reverse side of the router. Write down the password and SSID for the router. You will need this information to access it.

Example Router Data:

Figure C-2.   ZyXEL MWR102 Travel Router

Connecting the Router to the PIM Master

The router has two Ethernet ports. One is marked 'LAN' (colored black) and the other is marked 'WAN' (colored blue). Insert one end of the provided Ethernet cable into the black LAN port on the router, and insert the other end into the Ethernet port of your PIM Master.

Insert the Mini-B (small) end of the provided USB cable into the router, and insert the Type-A (larger) end of the cable into one of the USB ports of your PIM Master.

The router can be secured to your PIM Master chassis by using a small strip of Velcro or other hook-and-loop fastener.

Configuring PIM Master for use with Router

Configuring the MW82119B PIM Master for use with a Portable Router (such as ZyXEL MWR102 or equivalent).

1. Press **Shift** and **System** (**8**) to display the System Menu.

2. Press the System Options submenu key, then the Ethernet Config submenu key.

3. Configure the Ethernet connection. The example IP address is 192.168.100.5 in Figure C-3.

   Figure C-3 is an example of the Ethernet Editor. Your information night be different. For example, 255.255.255.0 should be the subnet mask.

   For additional configuration instructions, refer to "Ethernet Configuration" on page F-1 in Appendix H, "LAN and DHCP".
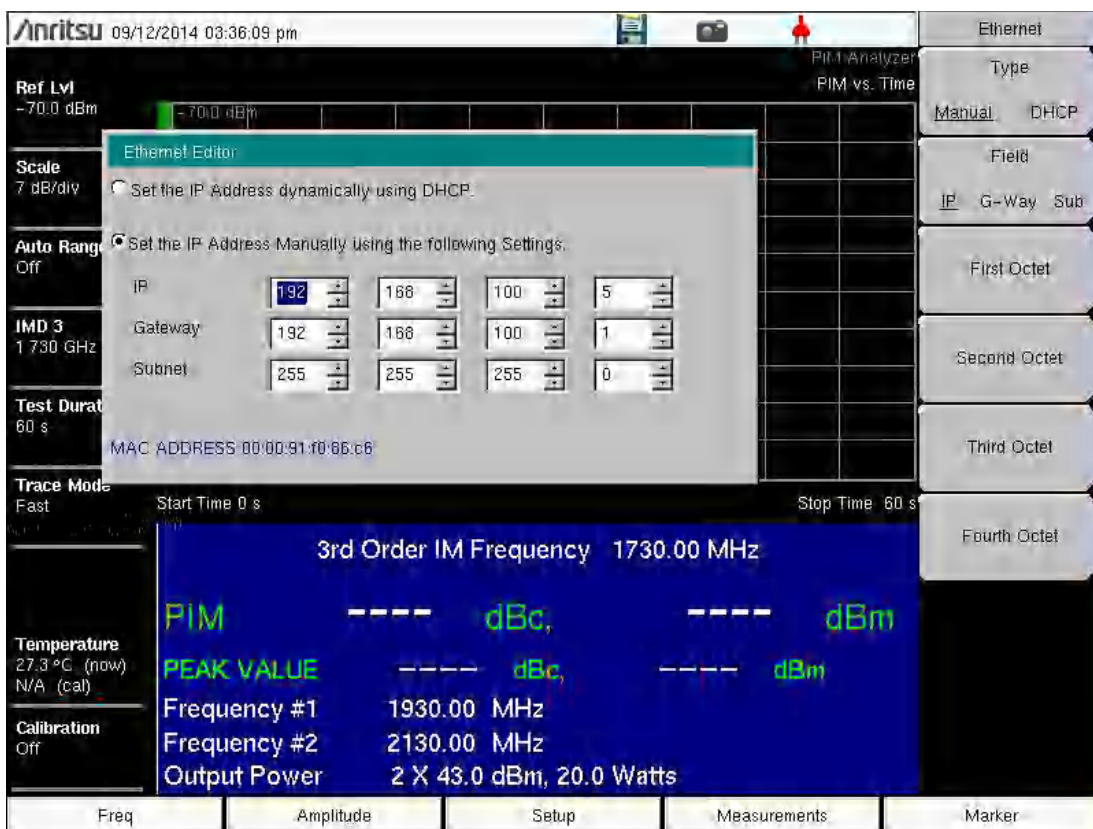
Figure C-3.   Example of Entering Ethernet IP Address

4. Ensure that your wireless device (phone, tablet, laptop) is connected to the router. Then launch your browser.

5. Enter the PIM Master IP address in the browser URL field, and wait while the connection is made.

6. When the browser connection is complete, the initial instrument control window is displayed (see Figure C-4 on page C-5). This window provides instrument status information.

The example IP address (192.168.100.5) appears in the title bar of the instrument control window (as shown in Figure C-4).

Figure C-4.   Example of Browser Control Window

C-5   Remote Control via a Browser

Select the Remote Control tab of the browser control window to display a copy of the PIM Master measurement screen. Follow the same process on this screen as you would on the PIM Master itself.

A green communication activity indicator in the lower-right-hand corner indicates the connection status with the PIM Master. An example of the remote control screen is shown in .

Figure C-5.   Example of Browser Remote Control Window

Screen Capture

Selecting the Capture Screen tab of the browser control window saves a time-stamped screen shot of the instrument display, in both the PIM Master memory and the web browser. You can save the image, and you can also send it via e-mail from this screen.

Selecting the Capture Trace tab of the browser control window performs the same function as pressing the Save Measurement submenu key on the PIM Master. Enter a filename and click Save.
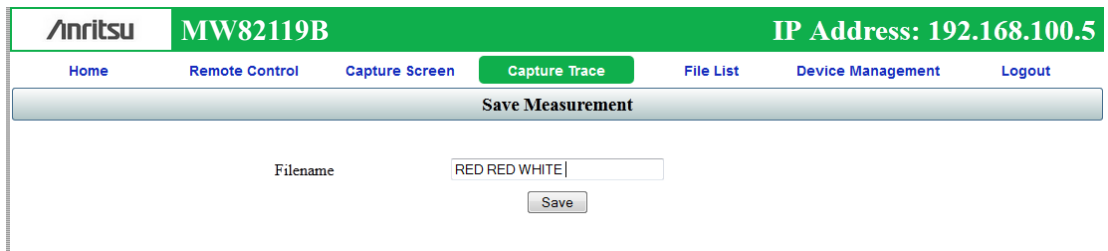
Figure C-6.   Example of Browser Saving Captured Trace

List of Files

The File List tab of the browser control window displays a table of the files in the PIM Master internal memory.
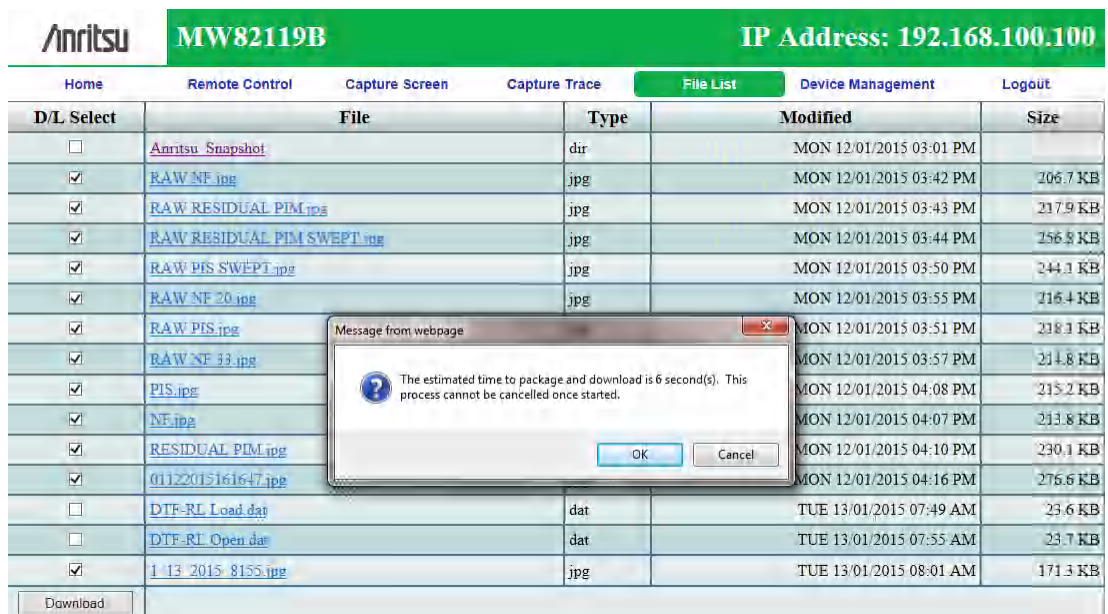
Figure C-7.   Example of Browser File List Window

You can use the check boxes in the D/L Select column to download multiple files in one download action. A message box provides an estimated time for the download to be prepared. The Web page becomes unresponsive while the download package is being prepared, and then becomes responsive again when the download starts. The process cannot be canceled after it is started. If the process is interrupted, then you do not receive the requested files. Repeat your request.

Note	File download is not possible with devices running an iOS operating system.

Using Anritsu Line Sweep Tools

If your controlling device is a laptop computer with Anritsu Line Sweep Tools (LST) installed, then you can use LST to open the PIM Master measurement files directly from the Browser File List, and then generate site reports. Figure C-9 on page C-9 shows LST working with the same trace as shown in Figure C-5 on page C-6.
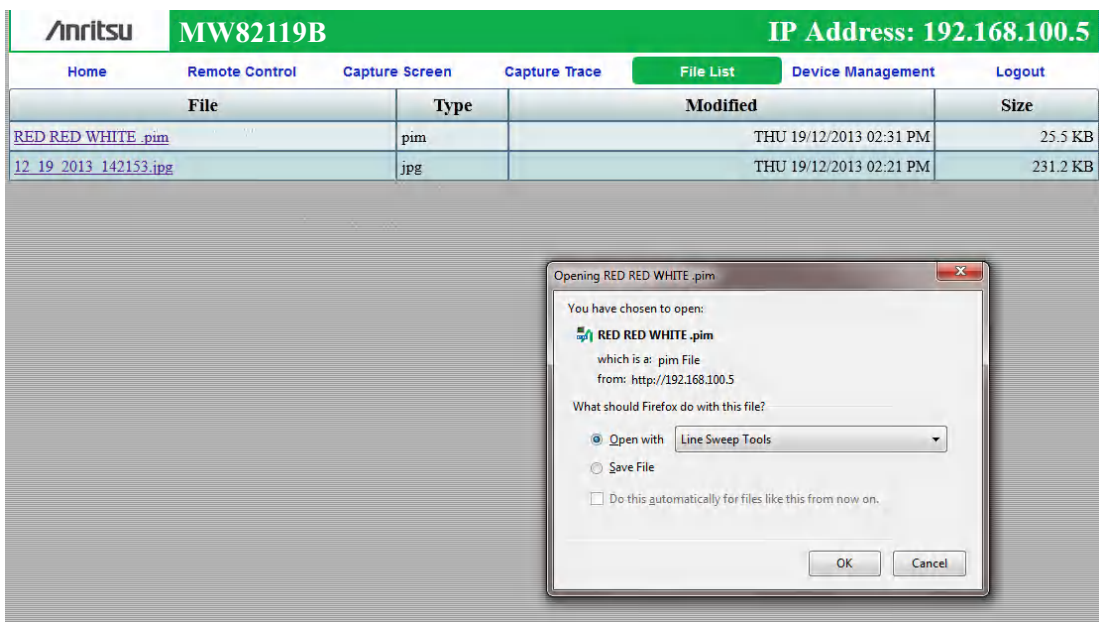
Figure C-8.   Example Using LST to Open a File in Browser List
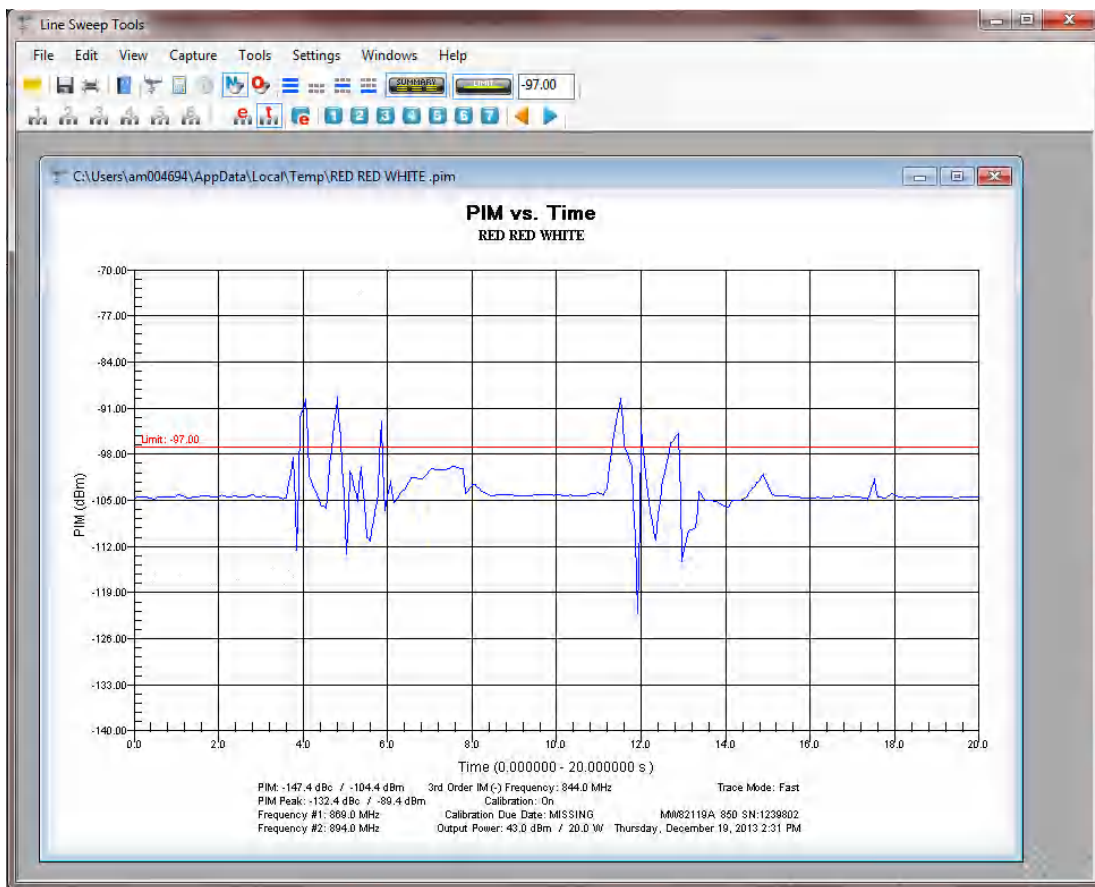
Figure C-9.   Example of Trace in Line Sweep Tools

Saving Measurements

Saving a measurement with the browser is similar to saving on the PIM Master itself. The Save dialog box is shown in . A saved measurement is shown in the Delete dialog box in .

Figure C-10. Example of Save Dialog Box
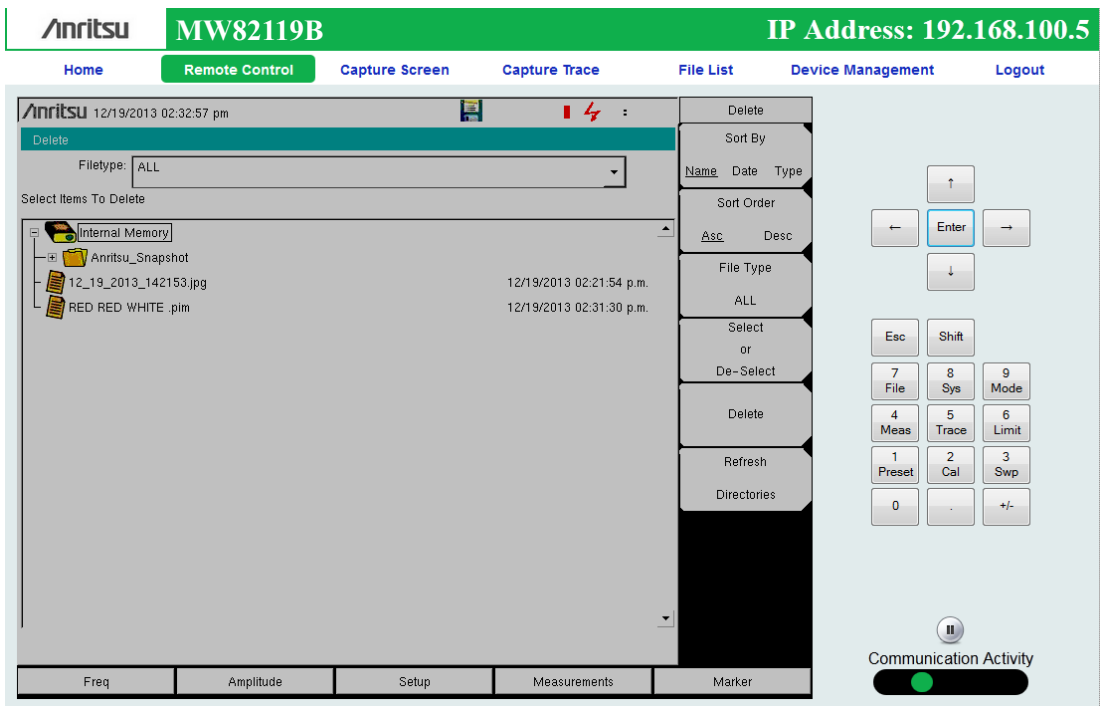
Figure C-11. Example of Delete Dialog Box

Password Protection

Access via router and browser can be password protected. If your router does not have a password, or if you chose not to use it, then you can set a password in the browser remote control window by using the Device Management tab. By default, no password protection is set for browser access. Figure C-12 shows a password example.

After a password has been set, you must use the password to gain access to the PIM Master. Figure C-13 shows the password request window. After the password has been entered, access to the PIM Master is open via the router to any computer device with router access until you log out. Use Logout in the browser tab bar to end your access.

/Inritsu   **MW82119B**   **IP Address: 192.168.100.5**

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

Change Password

New Password   ••••••••   Default: None
Confirm Password   ••••••••

Save   Reset

The instrument Master Reset function will restore the defaults,
Master Reset is found under *Shift, 8, System Options, Reset, Master Reset.*

Clicking the **Reset** button above will clear the current password.

Change Instrument Name

New Name   [ ]   Default: None

Save

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, 8, System Options, Name.*

Figure C-12. Browser Device Management Window

/Inritsu   **MW82119B**   **IP Address: 192.168.100.5**

Password: ••••••••

Login

Enter your password and
press Login to continue.

Figure C-13. Browser Password Request Window

Instrument Name

You can set a name for the PIM Master from the Device Management tab (Figure C-14). This is the same as using the System menu in the PIM Master to enter a name. An instrument name can be a convenient addition when creating measurement reports.

Figure C-14. Changing the PIM Master Instrument Name

Appendix D — Instrument Messages and Errors

D-1   Error Messages: Stop Current Measurements

Warning! High Reflection from measurement path!

This message occurs when the connection to the test port produces large reflections back into the instrument. This can compromise measurement accuracy. To fix this error, check all junction connections, or remove the RF connection or component that is causing the high reflection. The automatic Distance-to-Fault (DTF) function performed before each Distance-to-PIM (DTP) test mode can be used to help determine the location of the high reflection. An option will be presented allowing the user to continue PIM testing even in the presence of a high reflection. This should only be used by experienced users for troubleshooting purposes as the measured PIM value may not be accurate. A warning will appear in large letters on the screen any time that the high reflection warning has been by-passed.

D-2   PIM Analyzer Warning Messages

Warning messages provide information but allow measurements to continue.

RF PLL Lock Error
REF PLL Lock Error

These indicate a potential hardware failure that could compromise measurements. If the failure persists, contact your Anritsu Service Center.

Invalid Parameter Entry

If an invalid F1 or F2 frequency is entered, the instrument will display a warning message describing the acceptable range for the frequency carrier. If the IMx frequency does not fall within one of these bands, then the PIM Master produces an audible tone. In addition to the beep, the instrument will display a message on the screen indicating the allowed IM range. Also, the IM Frequency text in the PIM Summary area will turn red.

PIM AMP(S) Exceeding Normal Temperature Range

The PIM Master internal amplifiers have exceeded their normal temperature range.

PIM UNIT Exceeding Normal Temperature Range

The entire PIM Master unit is beyond the normal temperature range and degradation in measurement or signal dropout can occur.

PIM EEPROM Error

Can not access on-board EEPROM. Measurement results may be invalid.

IM OVERLOAD

This is a warning message that the measured signal level is approaching the saturation limit of the instrument. The actual signal level may be higher than the reported signal level under this condition. IM Overload is displayed in PIM vs. Time and Swept PIM measurement modes if PIM values exceed this saturation limit.

Receiver Amplitude Low

This message can occur if signal amplitude degrades within the instrument. It can have an impact on overall measurement accuracy and should be an indicator to send the unit to the Anritsu Service Center for repair.

High PIM Detected

This is a warning message presented during calibration if a high PIM level is detected before the step requiring a low PIM Load to be attached.

D-3   Operation Error Messages

Appendix E — Instrument Care

E-1   Introduction

This appendix provides instructions for preventive maintenance, battery care, and firmware updates.

Appendix Overview

This appendix contains the following sections:

E-2   Preventive Maintenance

PIM Master preventive maintenance consists of cleaning the unit and inspecting and cleaning the RF connectors on the instrument and all RF cables. Clean the PIM Master with a soft, lint-free cloth slightly dampened with water, or water and a mild cleaning solution.

Clean the RF connectors and center pins with a lint-free wipe or cotton swab dampened with isopropyl alcohol. Use a non-metallic object (such as the wooden end of a cotton swab) to push the lint-free wipe into the connector RF interface to remove metal flakes. Visually inspect the connectors. The pins of the 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 cables. To obtain accurate readings within instrument specifications, test port cables must be: free of metal flakes, uniform in appearance, and not stretched, kinked, dented, or broken.

E-3   Battery Care

The PIM Master is supplied with a rechargeable battery that could potentially leak hazardous compounds into the environment. These hazardous compounds present a risk of injury or loss due to exposure. Anritsu Company recommends removing the battery for long-term storage of the instrument and storing the battery in a leak-proof, plastic container.

Environmental storage requirements:

> Storage Temperature Limits: −20 °C to +50 °C, Relative Humidity ≤ 80 %

> The battery packs should be stored in an environment with low humidity, free from corrosive gas, at a recommended temperature range <20 °C. Extended exposure to temperatures above +40 °C could degrade battery performance and life.

Battery charging limits: 0 °C to +45 °C, Relative Humidity ≤ 80 %

The battery supplied with the PIM Master may need charging before use. Before using the instrument, the internal battery may be charged either in the instrument, using either the AC Adapter or the 12-Volt DC adapter, or separately in the optional Dual Battery Charger. Anritsu part numbers for these accessories are in your Technical Data Sheet/Product Brochure.

Use only Anritsu approved battery packs. Anritsu part numbers are in the Technical Data Sheet.

Recharge the battery only in the PIM Master or in an Anritsu approved charger.

When the PIM Master or the charger is not in use, disconnect it from the power source.

Do not charge batteries for longer than 24 hours. Overcharging may shorten battery life.

If left unused, a fully charged battery will discharge itself over time.

To prevent instrument damage, Anritsu Company recommends removing the battery for long-term storage of the instrument.

Temperature extremes affect the ability of the battery to charge: allow the battery to cool down or warm up as necessary before use or charging.

The battery can be charged and discharged hundreds of times, but it will eventually wear out.

The battery may need to be replaced when the operating time between chargings becomes noticeably shorter than normal.

Never use a damaged or worn out charger or battery.

Storing the battery in extreme hot or cold places will reduce the capacity and lifetime of the battery.

E-4   Battery Replacement

The battery compartment access is on the bottom of the PIM Master.

Figure E-1.   Battery Compartment - Open

The battery snaps into the compartment door assembly. Orientation of the battery is important. A diagram inside the battery door assembly and another diagram inside the PIM Master compartment show an image of the battery. Notice that the connector end of the battery is oriented away from the latch mechanism, and the battery connection openings are up, or away from the plate of the door assembly.

The image in the battery door assembly shows the orientation in which you should see the battery as you place the battery into the door assembly (see Figure E-3). Inside the PIM Master compartment is a reflected image of the battery (see Figure E-2) to show how the battery connectors align with the pins inside the compartment. As you place the battery door assembly into the battery compartment, the battery connectors and the reflected image should match, as if you were seeing the connectors reflected in a mirror.

To avoid connector pin damage, you must not press the battery downward onto the connector pins within the battery compartment. You must position the battery door assembly so that the battery connections can slide lengthwise onto the connector pins as you seat the door assembly against the bottom of the PIM Master. The tab on the door fits into a slot located on the edge of the case adjacent to the connector pins.
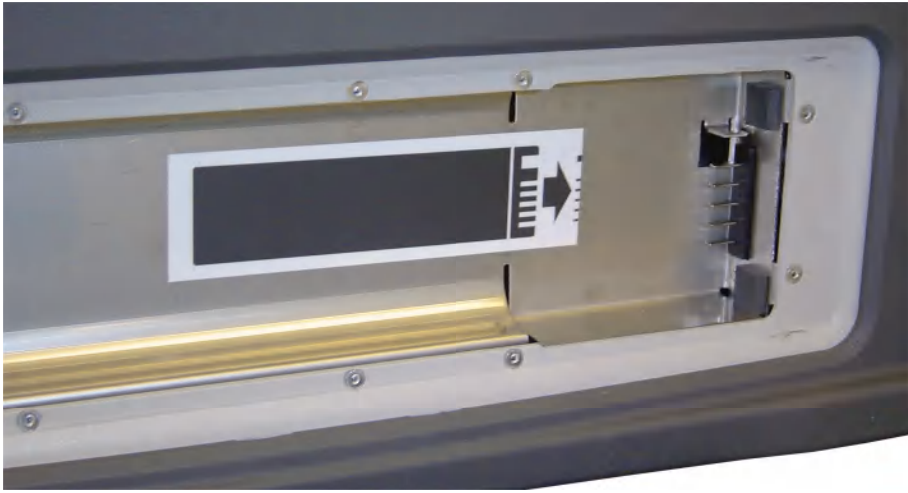
Figure E-2. Battery Orientation Diagram Inside Battery Compartment

Figure E-3. Battery and Cover Plate

Inserting the Battery into the Case

Figure E-4.   Closing the Battery Cover Plate

Place the blank edge of the door assembly into the PIM Master first and ensure that the connector end of the battery is as deep into the case as possible. This is to orient the battery connector openings with the connection pins inside the pm.

Slide the door assembly lengthwise into the PIM Master case making sure that the tab on the door assembly engages with the slot in the case. Continue moving the door assembly to seat the battery connections. When the latch is aligned, close the door and twist the latch to lock the door in place. Turn the latch handle flat so that the PIM Master can sit flat when upright.

E-5   PIM Master Firmware Update

Please check the Anritsu PIM Master product page for firmware upgrade procedures.

http://www.anritsu.com/en-us/products-solutions/products/MW82119B.aspx

If further assistance is needed, contact Anritsu at http://www.anritsu.com/contact-us.

Determining the Firmware Version

To determine the current firmware version of your PIM Master, use the following procedure:

1. Press the **Shift** and **System** (**8**) keys to display the System menu.
2. Press the Status submenu key to display instrument status.

   The Status list box displays instrument conditions and firmware versions.
3. Note the "Package Version" number and the "MINIPIM Version" number.

The latest available version of firmware can be determined by visiting the product link (shown above) or by visiting the "Generic Firmware Download" page.

Downloading the Firmware

You can search the Anritsu Web site in two ways to find the firmware for your PIM Master, either "Generic Firmware Download" or "PIM Master Product Page Firmware Download".

Generic Firmware Download

1. Enter the Anritsu Web page:

   http://www.anritsu.com
2. In the upper-left corner, enter 'firmware update' (do not use the quotes) in the Search box, and then press Enter.
3. Click the link for 'Handheld RF Firmware Updates' near the top of the page.
4. On The Anritsu Tool Box page, click the Firmware Updates link for PIM Master.
5. On the Firmware for PIM Master page, click the Download Now link for Model MW82119B.
6. In the table on the download page, click the green Download button. Note the file details in the download dialog box, which include the file size and its release date.
7. In the download dialog box, click Save and direct the download to your USB memory device. You can also download to your PC and copy to a USB memory device later.

PIM Master Product Page Firmware Download

1. Navigate to the PIM Master product page:

   http://www.anritsu.com/en-us/products-solutions/products/MW82119B.aspx
2. Click the Library tab.
3. Scroll to the section labeled Drivers, Software Downloads.
4. Click Firmware Update for the PIM Master MW82119B.

5. On the Firmware Update page, click the Download button. Note the file details in the download dialog box, which include the file size and its release date.

6. In the download dialog box, click Save and direct the download to your USB memory device. You can also download to your PC and copy to a USB memory device later.

Updating with a USB Memory Device

The PIM Master contains a feature that allows you to update its firmware by using a USB memory device. First, you must load the USB memory device with the firmware (refer to "Downloading the Firmware" on page E-6). Anritsu recommends that you format the USB memory device before loading the firmware. After the firmware is loaded onto a blank USB memory device, follow the instructions below to update the firmware on your PIM Master.

Caution	Before beginning the firmware update process, connect an external power supply (either the AC/DC power supply or the automotive 12 VDC adapter) to your PIM Master. The power must remain On until the firmware update is complete.

1. With the PIM Master off, insert the USB Memory device into the USB port and turn on your PIM Master. The PIM Master will recognize the new firmware in the USB device.

   The USB Memory device can be inserted while the PIM Master is On, but the update firmware is not checked until the instrument is turned Off and then On.

2. A message is displayed to inform you that new firmware is ready for update, and you are asked to choose whether to update now, by pressing the **Yes** or the No submenu key. Press Yes to begin the update.

3. The Firmware Update menu is displayed, the Firmware Update dialog box (Figure E-5) shows "Save none" selected, and a cautionary statement is displayed regarding user data. Use the **Arrow** keys to select an option. The choices are:

   a. Save none

   No attempt will be made to save any user data.

   b. Save user data

   User data will be saved in the selected external media device.

   WARNING: If there is not enough available memory space for all user data then some data may be lost during the process.

   c. Save and restore user data

   User data will be saved in the selected external media device. The instrument will also attempt to restore the files to the instrument after the update.

   WARNING: If there is not enough available memory space for all user data then some data may be lost during the process.
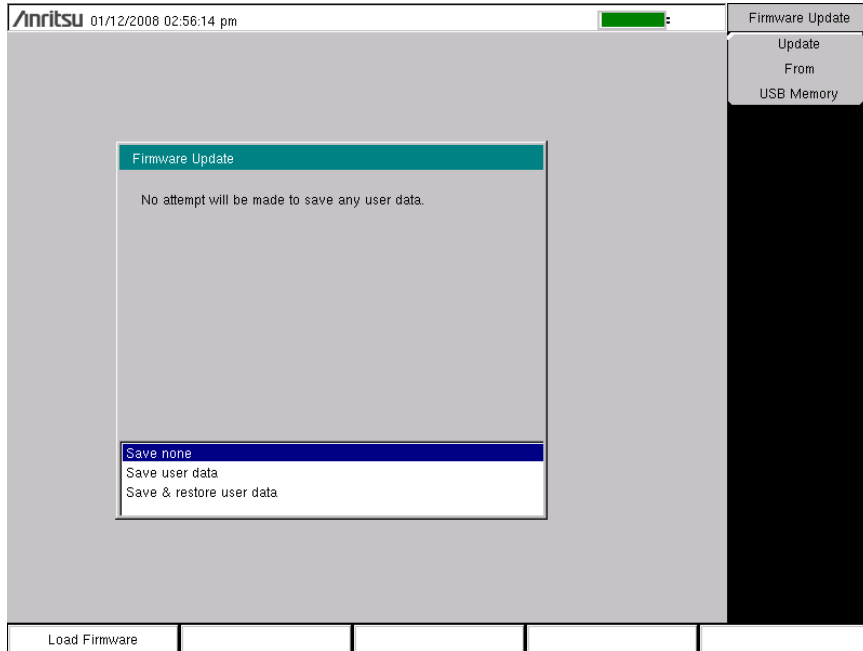
Figure E-5.   Firmware Update Menu

    4. Read through each choice carefully, select the desired save mode, and then press the Update From USB Memory submenu key or press **Enter** to begin the firmware update process.

    5. The Firmware Update message box is displayed and directs you to press ENTER to continue or to press ESC to abort (Figure E-6).
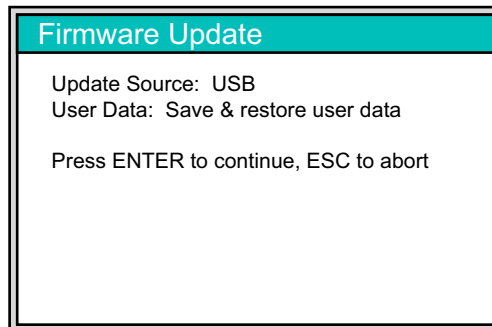
Figure E-6.   Firmware Update Message Box

    6. Press **Enter** to begin the firmware update process. The Firmware Update dialog box displays the following message:

       `Updating firmware. Please Wait.`

    7. When complete, the instrument reboots.

E-6   Adding Options with a License File

The license file installation process allows you to enable instrument software options. Only option retrofits that do not require additional hardware or calibration are qualified for enabling via a license file.

After you purchase an option, a license file is sent via e-mail or secure FTP. You copy that license file to a USB memory device and enable the option in your PIM Master.

First, to purchase an option, you need the PIM Master model number, serial number, and auxiliary serial number. Provide this to Customer Service when you place your order. When your purchase order is placed, Customer Service will advise you whether the option qualifies for enabling via a license file. If applicable, Customer Service will send you a license file via e-mail or secure FTP.

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

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

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

To install a license file onto an instrument, you must load it onto a blank USB memory device. Anritsu recommends that you format the USB memory device before loading the file. Use the following procedure to enable an option on your PIM Master:

1. When you receive the "`MW82119B xxxxxxx.license`" file, where "`xxxxxxx`" is the instrument serial number, copy that file to a blank USB memory device.

2. With the PIM Master Off, place the USB memory device into the USB Interface (Type A). See Figure 2-8 on page 2-11 for a description of the side panel connectors.

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

4. Turn Off the PIM Master, remove the USB memory device, and turn On the PIM Master.

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

Appendix F — LAN and DHCP

F-1   Introduction

This appendix describes network connections for the PIM Master.

F-2   Ethernet Configuration

LAN Connection

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

Note	An active Ethernet cable must be connected to the instrument before it is turned ON in order to enable the Ethernet port for DHCP or for a static IP address.
	Depending upon local conditions, the port may remain enabled when changing from DHCP to static IP address, when changing from static IP address to DHCP, or when temporarily disconnecting the Ethernet cable.
	If the port becomes disabled, then ensure that an active Ethernet cable is attached to the instrument before cycling the power OFF and back ON.

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

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

To display the IP address with the instrument on, press the **Shift** key, then the **System** (8) key, then the System Options submenu key and the Ethernet Config submenu key. The IP address will be displayed as shown in Figure F-1. The image on the display panel of your PIM Master may differ from the image shown here.
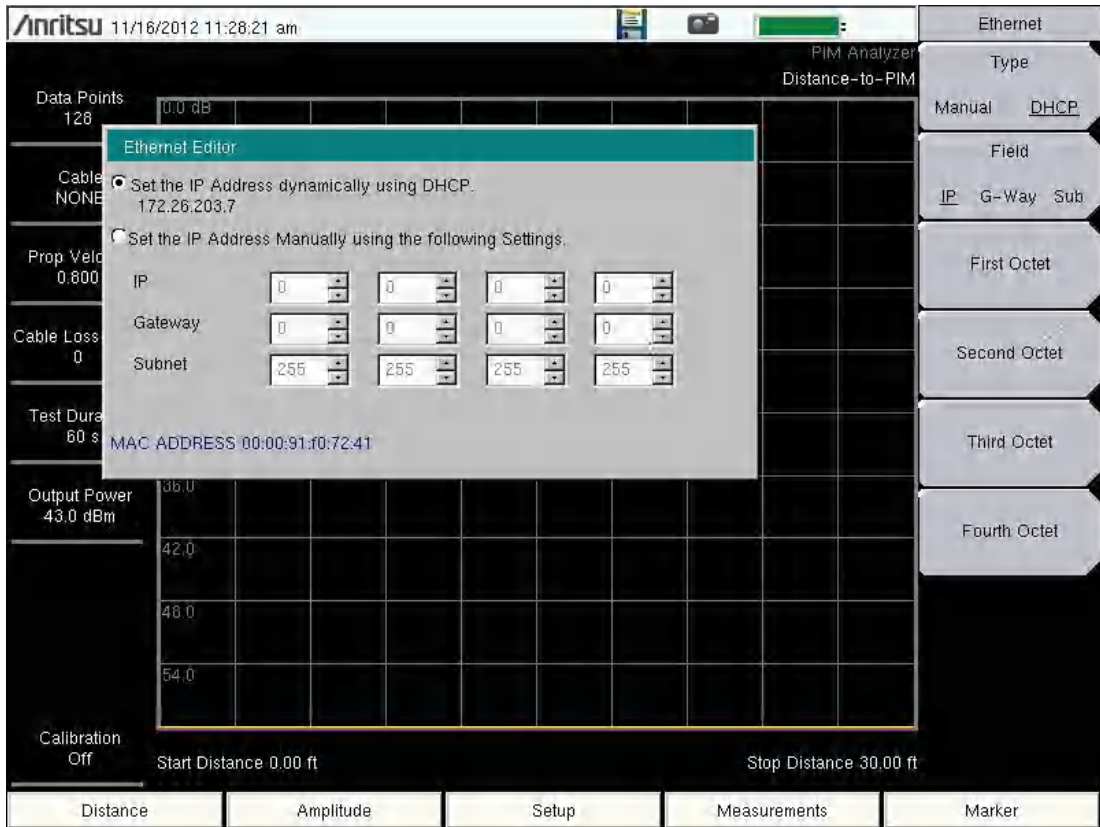
Figure F-1.   IP Address Assigned Using DHCP

Ethernet Config

Press this submenu key to display the Ethernet submenu and to open the Ethernet Editor dialog box in order to set the IP address of the instrument.
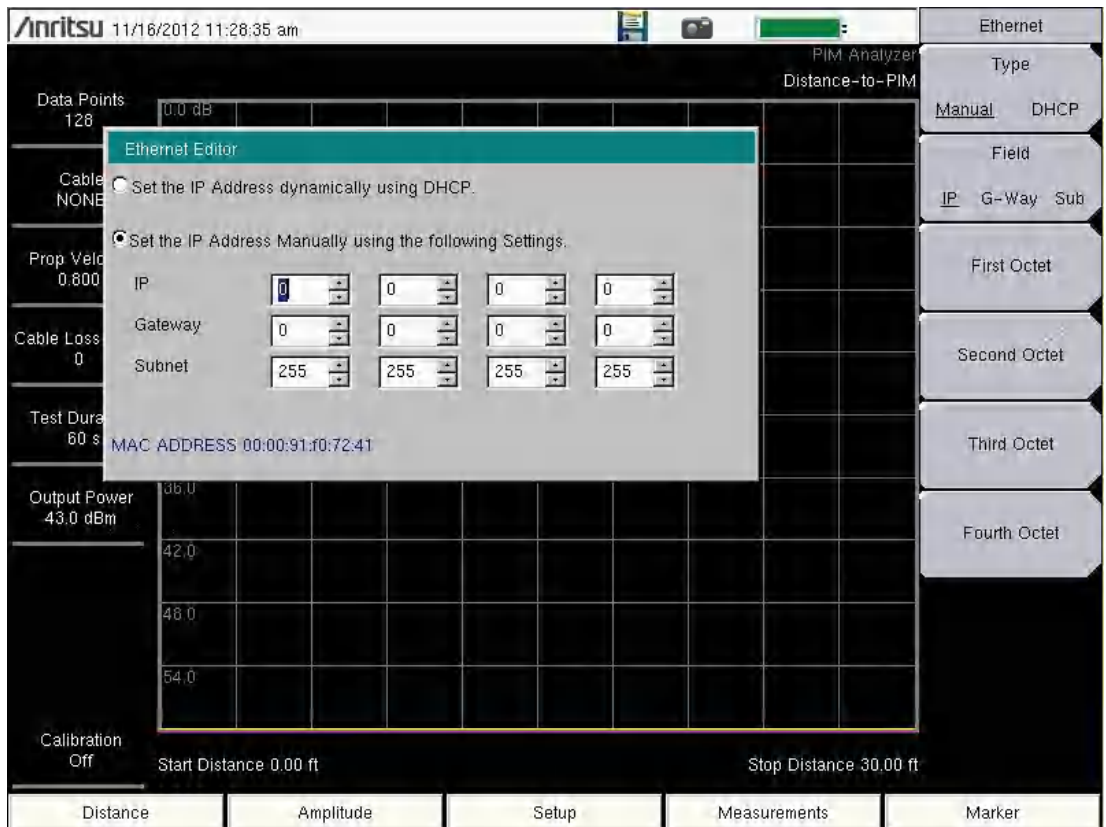
Figure F-2.   Setting IP Address Manually

Ethernet Menu

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

Ethernet	**Type**
Type	**Manual DHCP:** Press this submenu key to select whether the address will be entered manually, or will be supplied automatically by a network DHCP server. If Manual is selected, then use the submenu keys or the **Left/Right** arrow keys to select the field that is to be modified. Use the keypad or the **Up/Down** arrow keys to enter the input. Press **Enter** to accept the changes, or press the **Esc** key to return to normal operation without changing anything.
Manual DHCP	
Field	**Field**
IP G-Way Sub	**IP G-Way Sub:** Press this submenu key to select the desired Internet Protocol Property to be edited.
First Octet	**First Octet:** Moves the cursor to the left most column of the selected IP properties field.
Second Octet	**Second Octet:** Moves the cursor to the second column from the left of the selected IP properties field.
Third Octet	**Third Octet:** Moves the cursor to the third column from the left of the selected IP properties field.
Fouth Octet	**Fourth Octet:** Moves the cursor to the forth column from the left of the selected IP properties field.

Figure F-3.   Ethernet Menu

F-3 DHCP

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

When using DHCP, no setup is required to lease and use a dynamic IP address. In a dynamic IP operation, the IP address in use may change from use to use. The DHCP server hands out IP addresses on a first come, first served basis. As soon as the device is disconnected from the network, the IP address that it was using becomes available to lease to the next unit 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.

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
```

F-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
```

F-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 G — Glossary

G-1 Introduction

This glossary provides definitions for common RF terms that may be associated with the use of a PIM Master.

G-2 Glossary Terms

3 dB rule : The 3 dB rule provides a means to estimate relative power values. A 3 dB gain indicates that power increases to twice the power (a multiple of 2). A 3 dB loss indicates that power decreases to half the power (a multiple of 1/2). A system with 40 watts of input power and a 6 dB insertion loss will have only 10†watts of output power (a multiple of 1/2 for each 3 dB loss, or 1/4 of 40 watts).

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

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

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

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

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

Antenna : Antenna is a device which radiates and/or receives radio signals, including RF, microwave, and RADAR.

Antenna beamwidth : Antenna beamwidth, also known as the half-power beamwidth, is the angle of an antenna pattern or beam over which the relative power is at or above 50% of the peak power.

Antenna Directivity : Antenna directivity, also known as antenna gain, is the relative gain of the main beam of an antenna pattern to a reference antenna, usually an isotropic or standard dipole. Antenna Directivity is the percentage of radiated signal transmitted or received in a given direction related to beamwidth.

Antenna Efficiency : Antenna Efficiency is the percentage of theoretical gain actually realized from an antenna.

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.

Antenna, Isotropic : An isotropic antenna is a theoretical point source radiating a spherical power envelope.

Antenna, Parabolic : A parabolic antenna is an antenna utilizing a reflector that is shaped as a paraboloid in order to both concentrate the radiated signal into a beam and to provide considerable gain. Beamwidth varies inversely and gain varies directly with the size of the antenna and with frequency.

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.

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.

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.

Calibration :   When making measurements, the instrument must be calibrated in order to remove residual errors due to measurement setup conditions. Anritsu recommends performing the calibration under the same conditions as the measurement: temperature, frequency, number of points, source power, and IFBW. Calibrations standards with known reflection coefficients are used to calculate the correction factors. The calibration must be conducted using the appropriate standards at the open end of any test port cables and adapters that are connected to the instrument. This ensures that the match, phase length, and loss of these cables and adapters are all accounted for. For optimal performance, high quality phase-stable cables and precision adapters must be used.

Cell Site :   Cell Site, also called Base Station, is the local cellular tower and radio antenna (including the radios, controller, switch interconnect, etc.) that handles communication with subscribers in a particular area or cell. A cellular network is made up of many cell sites, all connected back to the switch via landline or microwave.

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.

dB : Decibel or deciBel (dB) is a logarithmic ratio of the difference between two values (a logarithm ratio is equal to 10 times). 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 -3 dB loss indicates a 50% loss in power; a +3 dB 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. Common values of dB expressed in ratios: 0 dB = 1:1, 10 dB = 10:1, 20 dB = 100:1, 30 dB = 1000:1, -30 dB = 0.001:1 [or (1/1000):1].

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 an absolute measurement of power relative to 1 milliwatt. In other words, 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. Examples are: 0 dBm = 1.0 milliwatt, 10 dBm = 10 milliwatt, 30 dBm = 1000 milliwatt = 1 watt.

DHCP : Dynamic Host Configuration Protocol (DHCP)

DSP : Digital Signal Processing (DSP)

DTF : Distance-To-Fault (DTF) is the distance from the instrument output connector (or the end of a test lead) to a problem area, as indicated by a peak in the displayed signal. DTF measures the location and reflection size of impedance mismatches. This is typically a diagnostic measurement, not a pass/fail judgement measurement. DTF is used to identify and locate faults within an antenna system when the system is failing to meet the specified return loss or VSWR limits. DTF is also useful to verify the total length of a coaxial cable assembly.

DTP : Distance-To-PIM (DTP), where PIM is Passive Intermodulation. DTP is the distance from the PIM Master output connector (or the end of a test lead) to a problem area, as indicated by a peak in the displayed signal.

FFT : Fast Fourier Transform (FFT) is an efficient algorithm to compute the Discrete Fourier transform (DFT) and its inverse. FFTs are of great importance to a wide variety of applications, from digital signal processing to solving partial differential equations to algorithms for quickly multiplying large integers.

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. It is a specific type of EEPROM (electrically erasable programmable read-only memory) that is erased and programmed in large blocks.

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 meters to 100 meters. The satellites use simple mathematical calculations to broadcast information that is translated as longitude, latitude, and altitude by Earth-based receivers.

Impedance :   Impedance is a measure of RF component electrical resistance, measured in ohms. In most cable and antenna systems, the standard impedance is 50 ohms.

Insertion Loss :   Insertion Loss (or Cable Loss) is a measure of the total amount of signal energy absorbed (lost) by the cable assembly. It is measured in dB. S21 (an S-Parameter) is another name for this measurement.

IP Address :   An Internet Protocol address (IP address) is usually a numerical label that is assigned to each device (computer or printer for example) that is participating in a computer network that uses the Internet Protocol for communication. An IP address serves two main functions: location addressing and host (or network) interface identification. The Internet Protocol originally defined an IP address as a 32-bit number. This was known as Internet Protocol Version 4 (IPv4), which is still in use. Growth of the Internet requires a new addressing system. An Internet Protocol Version 6 (IPv6) that uses 128 bits for the address was developed in 1995, and it is standardized as RFC 2460. IPv6 began being deployed worldwide in the year 2000. IP adresses are binary numbers, but they are usually stored in text files and displayed in human-readable notations, such as decimal nnn.nnn.nnn.nnn or 172.16.255.1 (for IPv4), and hexadecimal nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn or 2C01:AB18:0:1234:FF03:567C:8:1 (for IPv6). In IPv4, each decimal group (nnn) represents values from 000 to 255, or binary values of 8 bits. In IPv6, each hexadecimal group (nnnn) represents values from 0000 to FFFF, or binary values of 16 bits (0000 0000 0000 0000 to 1111 1111 1111 1111).

IPv6 : Internet Protocol Version 6 (IPv6) is a numerical label that is used to identify a network interface of a computer or other network node participating in an IPV6-enabled computer network. IPv6 uses 128 bits for the address (as compared to an IPv4 address, which is defined as a 32-bit number). Pv6 was developed in 1995, and it is standardized as RFC 2460. V6 began being deployed worldwide in the year 2000. I addresses are binary numbers, but they are usually stored in text files and displayed in human-readable notations, such as hexadecimal nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn.nnnn or 2C01:AB18:0:1234:FF03:567C:8:1 (where FFFF [Hex] = 65535 [Dec]). Ea hexadecimal group (nnnn) represents values from 0000 to†FFFF, or binary values of 16 bits (0000 0000 0000 0000 to 1111 1111 1111 1111).

LST : Line Sweep tools (LST) is PC-based post-processing software that efficiently manipulates line sweep and PIM traces for reporting purposes.

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. $NF = 10\log (F)$ where log uses the base 10, or common log. This formula is valid only then the input termination is at standard noise temperature.

OSL : OSL or Open Short Load calibration method for coaxial line types. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with SSL or Offset Short 1, Offset Short 2, Load calibration method for waveguide line types.

OSLT : OSLT or Open Short Load Thru calibration method for coaxial line types. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with SSLT or Offset Short 1, Offset Short 2, Load, Thru calibration method for waveguide line types.

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).

PIM : Passive Intermodulation (PIM) (interference) PIM is a form of intermodulation distortion that occurs in passive components normally thought of as linear, such as filters, combiners, surge protectors, cables, connectors, and antennas. When subject to the high RF powers found in cellular systems, these devices can generate spurious signals. PIM shows up as a set of unwanted signals created by the mixing of two or more strong RF signals in a non-linear device, such as in a loose or corroded connector, or in nearby rust. Other names for PIM include the diode effect and the rusty bolt effect.

Return Loss : Return Loss is a measurement (in dB) of reflected energy caused by impedance mismatch. May also be referred to as S11. Although S11 values are expressed as negative numbers, Return Loss values are expressed as positive numbers because by definition the ìLossî expression implies a negative sign. The higher the value, the better the impedance match (think of a large negative number being less than a smaller negative number). 40 dB is nearly ideal. Only 0.01 % of the total transmitted power is reflected if the Return Loss measurement value is 40 dB. A measured value of 0 dB would be a complete reflection, or stated another way, 100 % of the transmitted power is reflected back. Return Loss is typically a pass/fail measurement.

RF : Radio Frequency (RF) is the frequency of radio sine waves. RF generally refers to wireless communications within a frequency range of 3 kHz to 300 GHz. Formally, according to the Article 2 of the Radio Law, radio frequency is below 3,000 GHz. Radio frequencies can be used for communications between a mobile telephone and an antenna mast.

SCPI : Standard Commands for Programmable Instruments (SCPI)

SOLT : SOLT or Short Open Load Thru calibration method for coaxial line types with simple and redundant standards. It is not band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with SSLT or Offset Short 1, Offset Short 2, Load, Thru calibration method for waveguide line types.

SSL : SSL or Short Short Load or Offset Short 1, Offset Short 2, Load calibration method for waveguide line types uses Shorts with different offset lengths. It is a calibration (common in waveguide) with simple and redundant standards, but it is band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies. Offset Short 1 is 1/8 wavelength, and Offset Short 2 is 3/8 wavelength. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with OSL or Open Short Load calibration method for coaxial line types.

SSLT : SSLT or Short Short Line Thru or Offset Short 1, Offset Short 2, Load, Thru calibration method for waveguide line types uses Shorts with different offset lengths. It is a calibration (common in waveguide) with simple and redundant standards, but it is band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies. Offset Short 1 is 1/8 wavelength, and Offset Short 2 is 3/8 wavelength. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with OSLT or Open Short Load Thru calibration method for coaxial line types.

VSWR : Voltage Standing Wave Ratio (VSWR). VSWR is another method to measure reflected energy caused by impedance mismatch. It is expressed as a ratio of X:1. VSWR measures the voltage peaks and valleys. A ratio of 1:1 would be a perfect match. A typical cable and antenna system would be around 1.43:1 (VSWR) or 15 dB Return Loss.

Watt : Watt (W) is a unit of measure for power.

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