User Guide

Anritsu Power Master™ Using PowerXpert™

MA24507A, Frequency Selectable mmWave Power Analyzer, 9 kHz to 70 GHz

/Anritsu

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Chapter 5—Using the MA24507A Power Master

Chapter 6—MA24507A Power Master Operational Testing

Chapter 7—Remote Operation

Table of Contents (Continued)

Alphabetical Index of Programming Commands

Chapter 1 — General Information

1-1 Scope of Manual

This manual provides general information, installation and operating instruction for the Anritsu MA24507A USB Power Master power analyzer using the PowerXpert™ application.

1-2 Introduction

This chapter contains general information about Anritsu MA24507A USB Power Master. It includes the following information:

- General description of the device
- Identification number
- Initial inspection
- Preparation for storage and shipment

1-3 Description

The Anritsu MA24507A Power Master is a frequency selectable mmWave power analyzer that connects and communicates with a PC via USB. It can accurately measure signals as low as 9 kHz and up to 70 GHz. It is ideal for testing many mmWave applications, like 802.11ad, wireless backhaul, and other future 5G applications.

Note	The MA24507A Power Master uses a USB 3.0 interface for PC and remote communication and requires USB 3.0 as a power source.

1-4 Software and Documentation

All software and documentation for the MA24507A Power Master is available online. http://www.anritsu.com

Note	Anritsu follows a practice of regular improvement to our software; we recommend users check http://www.anritsu.com to ensure you have the latest versions.

Related Documentation

The documents listed below support PowerXpert with the USB power sensors and USB power analyzers:

- Anritsu Power Master Using PowerXpert User Guide – 10585-00029
  Supports: MA25407A
- Power Master Frequency Selectable mmWave Power Analyzer Technical Data Sheet – 11410-00948
  Supports: MA24507A
- PowerXpert and USB Power Sensor User Guide – 10585-00020
  Supports: MA24105A, MA24106A, MA24108A, MA24118A, MA24126A, MA24208A, MA24218A, MA24330A. MA24340A, and MA24350A
- PowerXpert Product Information, Compliance, and Safety (PICS) – 10100-00066
- For the latest updates on Product Brochures and Technical Data Sheets, visit us at http://www.anritsu.com.

PowerXpert Program

Provides the user interface to the power analyzer via USB connection to a PC.

Microsoft® .NET Framework Version 4.0

Available for installation if .NET Framework does not already exist on your PC. The PowerXpert installation program will detect whether or not this is already on your PC and will provide a message if it is not installed. PowerXpert needs .Net Framework 4.0. This framework version is included in both Minimal & Full version of installers. The difference between minimal & full is that the minimal installer uses a light weight web installer of .NET 4.0; therefore, PowerXpert requires the internet connection in order to make the installation. Full installer uses complete .NET 4.0 setup and does not need an internet connection to make the installation.

1-5   Initial Inspection

Inspect the shipping container for damage. If the shipping container is damaged, retain it until the contents of the shipment have been checked against the packing list and the power analyzer has been checked for mechanical and electrical operation. The following items are included with every shipment:

- MA24507A USB Power Master mmWave Power Analyzer
- 2000-1859-R 1.0 m USB A to C Port Cable
- Certificate of Calibration

If the shipment is incomplete or if the power analyzer is damaged mechanically or electrically, notify your local sales representative or Anritsu Customer Service. If the shipping container is damaged or shows signs of stress, notify the carrier as well as Anritsu. Keep the shipping materials for the carrier's inspection.

1-6   Power Analyzer Identification

All Anritsu power analyzers are assigned a unique seven digit serial number, such as "1601015". The serial number is printed on a label that is affixed to the unit. When ordering parts or corresponding with Anritsu Customer Service, please use the correct serial number with reference to the specific instrument's model number.

Customer Asset Tag Placement

When affixing an asset tag to the power analyzer, use an area on the cover plate as indicated below to ensure that the asset tag is retained with the product during service.

Figure 1-1.   Asset Tag Placement Location

1-7   Preparation for Storage/Shipment

Preparing the power analyzer for storage consists of cleaning the unit, packing the inside with moisture-absorbing desiccant crystals, and storing the unit in the recommended temperature environment. Please refer to the data sheet for storage temperature recommendations.

To provide maximum protection against damage in transit, the power analyzer should be repackaged in the original shipping container. If this container is no longer available and the unit is being returned to Anritsu for repair, please advise Anritsu Customer Service and use the following process to package the USB power analyzer for shipment:

Note	Disconnect any USB and Trigger cables before packaging the power analyzer.

- **Use a Suitable Container:** Obtain a corrugated cardboard carton. This carton should have inside dimensions of no less than 15 cm larger than the unit dimensions to allow for cushioning.
- **Protect the Instrument:** Surround the unit with polyethylene sheeting to protect the finish.
- **Cushion the Instrument:** Cushion the instrument on all sides by tightly packing urethane foam between the carton and the unit. Provide at least three inches of dunnage on all sides.
- **Seal the Container:** Seal the carton by using either shipping tape or an industrial stapler.
- **Address the Container:** If the instrument is being returned to Anritsu for service, mark the address of the appropriate Anritsu service center and your return address on the carton in one or more prominent locations.

1-8   Contacting Anritsu

To contact Anritsu, please visit: http://www.anritsu.com

From here, you can select the latest sales, service and support contact information in your country or region, provide online feedback, complete a "Talk to Anritsu" form to get your questions answered, or obtain other services offered by Anritsu.

1-9   Product Update Information

Updated product information can be found via the Anritsu Power Meters and Power Analyzers product page:

http://www.anritsu.com/en-US/test-measurement/rf-microwave/power-meters-and-sensors

Selecting your product model from the product page will lead you to a Library or Downloads tab that contains links to all of the latest documentation and downloads related to your Anritsu product.

Chapter 2 — Installation (PC Only)

2-1 Introduction

This chapter provides information on installing the Anritsu PowerXpert™ application and the MA24507A Power Master backend software,

- "Hardware and Software Requirements" for the Anritsu PowerXpert application
- "Installing PowerXpert" procedure

2-2 Hardware and Software Requirements

The following are the recommended minimum PC specifications for installing and using the software:

- Equivalent to Quad Core i5 fourth generation or higher CPU, 8 GB RAM, 128 GB Data Storage
- All versions of Microsoft® Windows7, Windows 8, Windows 8.1, Windows 10, and Windows Vista®, Windows XP (64 bit OS highly recommended)
- 100 MB hard-disk free space
- Display resolution 1024 × 768
- Super speed USB 3.0

2-3 PowerXpert Application and Power Analyzer Drivers

Both the PowerXpert application and power analyzer drivers must be installed before using the MA24507A Power Master. Follow the steps below as a guide for proper installation.

2-4   Installing PowerXpert

Microsoft® .NET Framework Version 4.0 Installation

PowerXpert needs .NET. This framework version is included in both Minimal & Full version of installers. The difference between minimal & full is that the minimal installer uses a light weight web installer of .NET 4.0; therefore, PowerXpert requires an internet connection in order to complete the installation. Full installer uses complete .NET 4.0 setup and does not need an internet connection to make the installation.

1. Go to http://www.anritsu.com. and type "PowerXpert" into the search. Find the "PowerXpert Analysis and Control Software" section and download the zip file.

2. Unzip the downloaded folder and find the PowerXpert_Full.exe.

3. Double click the application file.

Once the file is opened, the Installation begins. You see a Preparing Setup screen with a progress bar indicating the status of the Preparation Setup.

.
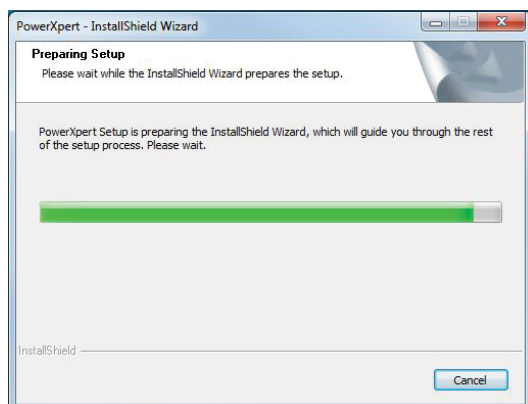
Figure 2-1.   Anritsu Preparing Setup

4. Select Next on the Welcome screen.
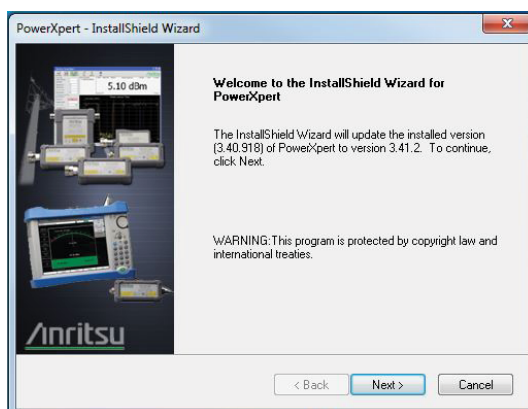
Figure 2-2.   Anritsu Welcome Screen

5. Read the license agreement and select "I Agree".

6. Select Next.
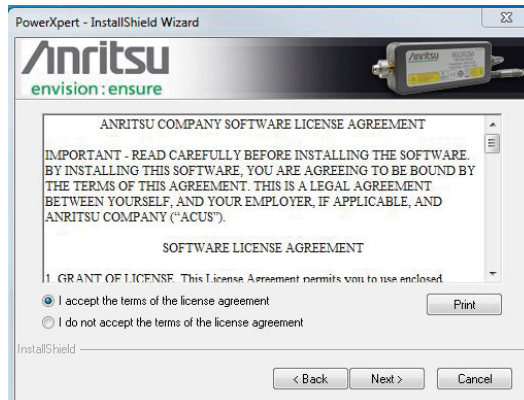
Figure 2-3. PowerXpert License Agreement

7. Select the Complete (Recommended) button.

8. Select Next.
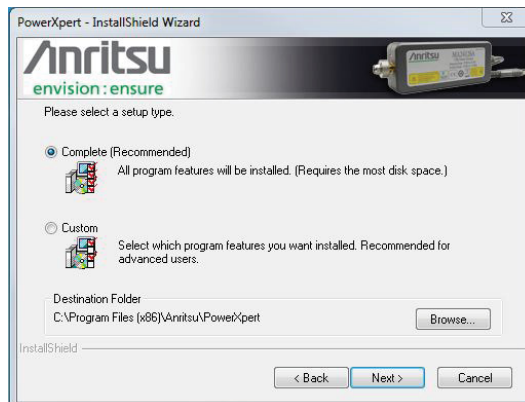
Figure 2-4. Select Setup Type

9. Select Install.
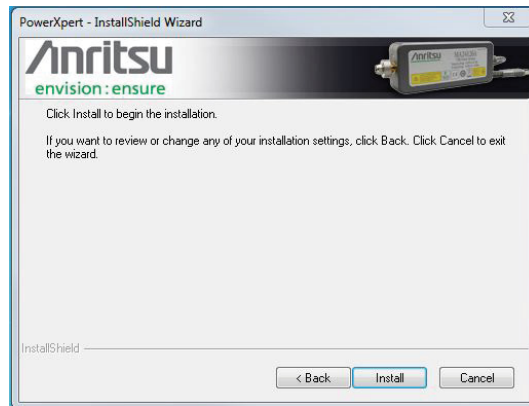
Figure 2-5.   Installing Anritsu PowerXpert Application

The software loads and installs to the selected location.
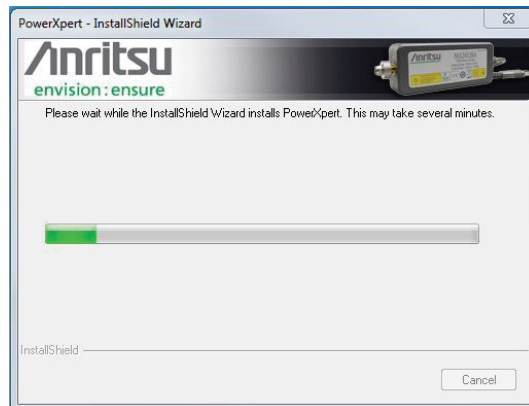
Figure 2-6.   Installing Anritsu PowerXpert Application

10. Select Finish to complete the installation.
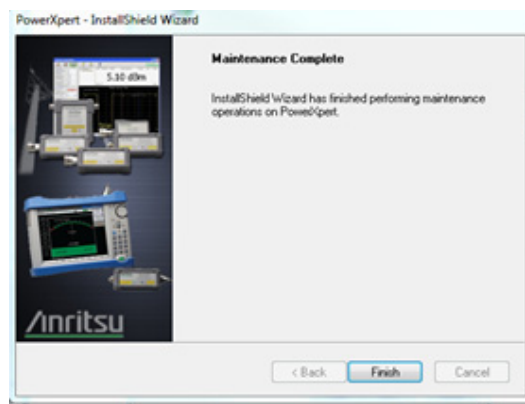
Figure 2-7.   Anritsu PowerXpert Installation Complete

2-5   Setting PowerXpert to Run in Windows XP Compatibility Mode
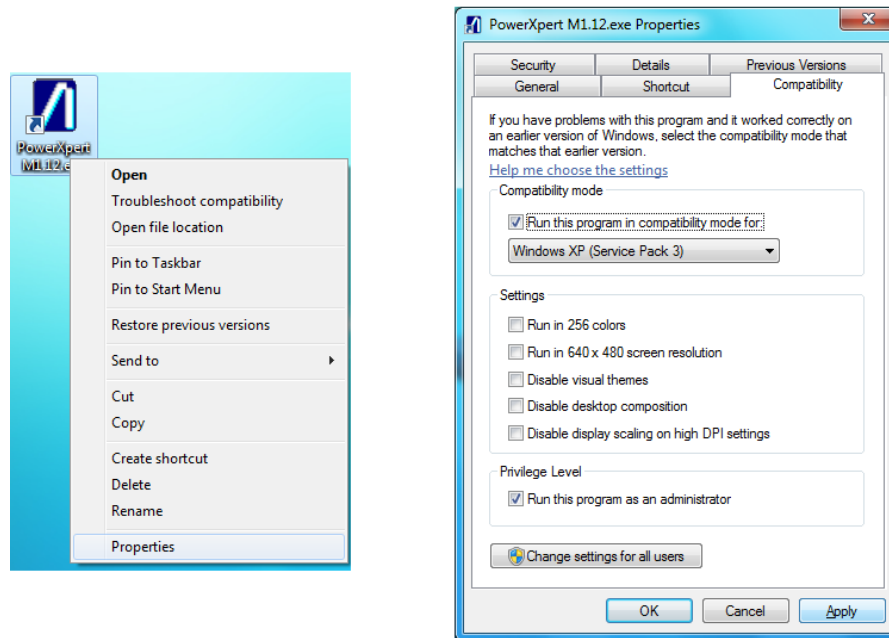
Figure 2-8.   Setting PowerXpert to Run in Windows XP Compatibility Mode

The PowerXpert application can be launched from the Windows Start menu from the Anritsu program group. Select **Install the software automatically (Recommended)**, and then click **Next**.
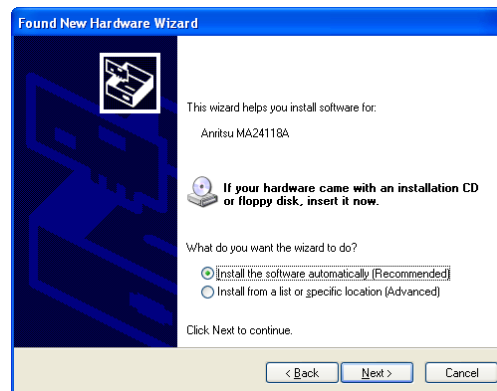
Figure 2-9.   Found New Hardware Wizard

Continue through all the instruction screens and then click Finish on the last screen to complete the installation.

Chapter 3 — Using MA24507A Power Master™ with PowerXpert™

3-1 Introduction

This chapter provides instructional information on using the Anritsu MA24507A USB Power Master with PowerXpert™. PowerXpert is a data analysis and control software for use with Anritsu's USB power sensors and USB power analyzers. PowerXpert provides a graphical user interface (GUI), making the PC appear like a traditional power meter. Using PowerXpert, the MA24507A Power Master power analyzer operates in three modes:

-
-
-

Note	When operating the MA24507A Power Master power analyzer, the MA241xxx Series, MA242xxx and MA243xxx USB sensors USB power sensors can be connected to make separate power measurements simultaneously in Continuous Mode. For details, see "Show Multiple Sensor Display" on page 3-21. There are modes and settings available only to the MA24507A Power Master that are described in this chapter. For detailed information on the operation of the MA241xxx Series, MA242xxx and MA243xxx USB power sensors, refer to the latest PowerXpert User Guide – 10585-00020 available at: http://www.anritsu.com.

3-2   PowerXpert™ Overview

Using the MA24507A Power Master power analyzer with PowerXpert provides a user interface as illustrated in Figure 3-1.

Index	Description
1	The PowerXpert Tool Bar provides three modes of operation to select from: • "Continuous Mode" on page 3-4 • "Power Hunter Mode" on page 3-8 • "Channel Monitor Mode" on page 3-12 The tool bar also provides access to: "Tools Menu" with access to "Zero All Sensors", "Capture Screen", "Log Data", and "Show Multiple Sensor Display", "Settings Menu" with access to "Resetting to Factory Settings" "Help".
2	This side panel displays the settings for the mode of operation selected
3	Click **Apply above settings** to apply the user selected settings changes. Changes to the settings will not take effect until after clicking this bar.
4	These lower task bar parameter settings are available to select and change manually. Changes to these settings are applied by pressing the **Enter** key. (The lower task bar parameter settings are used in Continuous mode only)

Figure 3-1.   Anritsu PowerXpert Application GUI Overview (1 of 2)

5	The display graticule provides power versus time representation of the power measurement waveform, "Graticule Settings and Graphical Display Area".
6	Displays setup and measurement readout area. The readouts displayed are mode dependent. "Continuous Mode Numerical Display Area" on page 3-7, "Power Hunter Mode Numerical Display Area" on page 3-10, "" on page 3-13.
7	Power sensor / analyzer information area showing model and serial number, communications port, and firmware version, "Sensor Information Area".

Figure 3-1.   Anritsu PowerXpert Application GUI Overview (2 of 2)

3-3   PowerXpert Settings

Connect Power Analyzer

Connect the USB connector side of the Power Analyzer Cable to the PC. Once connected, you see the sensor model number and serial number appear in the "Sensor Information Area" of the PowerXpert monitor display. This may take up to 30 seconds for the connection to be recognized and displayed. PowerXpert always starts up in the default state of the connected sensor. Upon disconnection from PowerXpert, the power analyzer resets and after reconnection, restarts in the default state.

Power Analyzer Modes of Operation

The USB MA24507A Power Master operates in three modes:

- Continuous Mode

  For display settings available and function see Figure 3-2, "Continuous Mode User Interface Screen" on page 3-4.

- Power Hunter Mode

  For display settings available and function see Figure 3-5, "Power Hunter Mode User Interface Screen" on page 3-8.

- Channel Monitor Mode

  For display settings available and function see Figure 3-8, "Channel Monitor Mode User Interface Screen" on page 3-12.

3-4   Continuous Mode

Continuous Mode is the default mode in which the MA24507A Power Master starts and displays the peak or average power of the input signal. In this mode, the USB power analyzer is "continuously triggered" and collects data at all times. The Continuous Mode window below contains the following information.
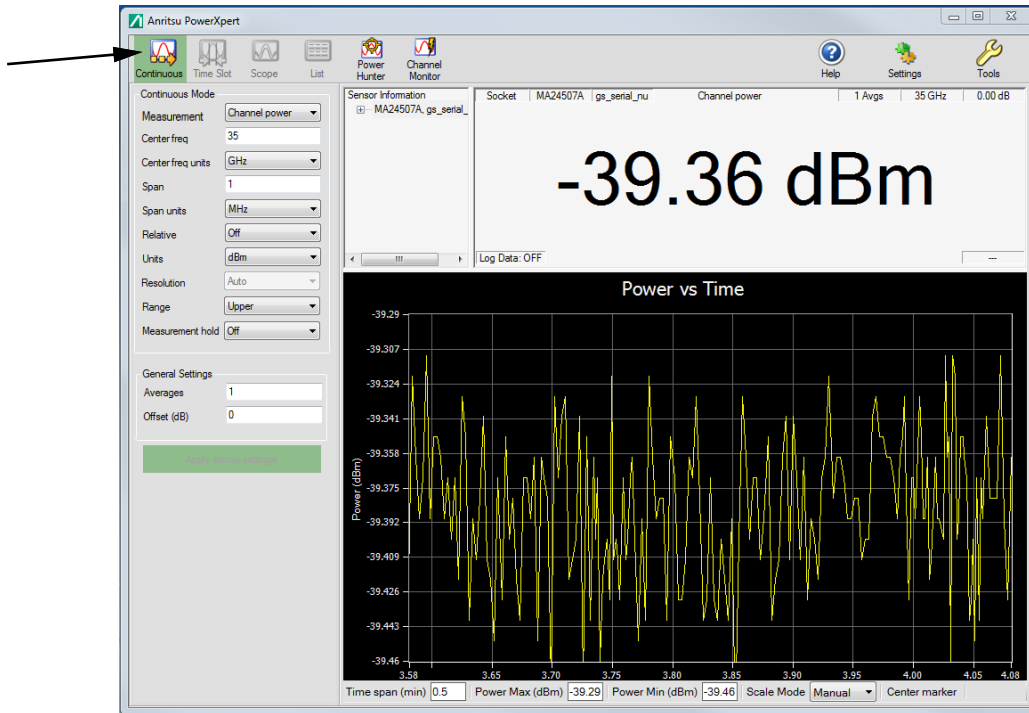
Continuous Mode Setting	Options/Range
Measurement	Channel Power / CW Max
Center Frequency	9.5 kHz to (70 GHz – 500 Hz)
Center freq units	kHz, MHz, GHz
Span	30 kHz to 2 GHz (Channel power), 1 kHz to Full span (CW max)
Span units	kHz, MHz, GHz
Relative	Off, On
Units	dBm, nW, µW, mW, W
Resolution	Low, Medium, High (Available in CW max mode)
Range	Upper, Lower
Measurement hold	Off, On
General Settings	
Averages	1 to 1000
Offset (dB)	–100 to +150
Apply Above Settings	Select Activates Settings

Figure 3-2.   Continuous Mode User Interface Screen

3-5   Continuous Mode Settings

Note	Changing the settings in Continuous Mode requires that the "Apply Above Settings Button" to be selected to activate any changed settings.

Measurement – CW/Channel Power

The CW/Channel mode pull down lets you select between Channel Power and CW Max mode. In Channel Power mode, the sensor will calculate the average integrated power across the entire user-defined span. Channel Power mode should be used when measuring average power of modulated signals.

In CW Max mode, the sensor will return the highest CW "peak" amplitude value within the user-defined channel. Note that the "peak" amplitude returned by the sensor is not necessarily at the user-defined center frequency. It is the highest average CW amplitude within the range of center frequency ± span/2.

Center freq and Span

Center frequency and span combine to define the frequency channel in which power will be measured. The channel will begin at Center freq - Span/2 and end at Center freq + Span/2. Center freq can be any value as long as Center freq - Span/2 $\geq$ 9 kHz and Center freq + Span/2 $\leq$ 70 GHz. In Channel Power mode, span is limited to 2 GHz, but can be as wide as full span in CW Max mode.

Relative

Relative measurements power changes with respect to the displayed power when relative mode is turned on. To reset the power reference, turn relative mode Off, and then back on. This mode is particularly useful to study drift or measure (loss of) attenuator and (gain of) amplifiers.

Note	Relative measurement is a feature of PowerXpert and does not apply to Crest Factor, CCDF, Reflection Coefficient, Return Loss, and VSWR.

Units

Displays units of power in linear or log scale (dBm, nW, µW, mW, W).

Resolution

Resolution is available when measurement setting is set to CW max. Resolution allows the user to choose between optimizing speed or lowering the noise floor. When Resolution is set to "Low", the sensor will make more readings per second, but have a higher noise floor. Conversely, setting Resolution to "High" will lower the noise floor, but the sensor will make fewer readings per second.

Range

There are two measurement ranges in the USB power analyzer: upper and lower. The range can be set manually to either the range via PowerXpert or remote commands.

Table 3-1. Power Analyzer Operating Power Range

det range	MA24507A Power Master
Upper	High power (> –10 dBm)
Lower	Low power ($\leq$ –10 dBm)

Measurement Hold

When set to On, holds the last sensor readings. When set to Off, the sensor continues to sample measurements.

Graticule Display Settings

The parameter settings available below the display screen provide control of the graticule power vs time settings. See Figure 3-3
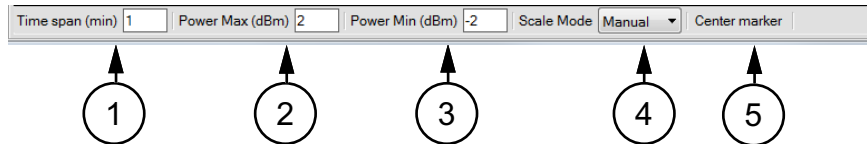
Index	Description
1	Time Span (min): Defaults to 1 minute. Manual setting range is 0.1 to 1440 minutes
2	Power Max (dBm): Defaults to Auto. Set Scale Mode (4) to Manual to change Power Max setting
3	Power Min (dBm): Defaults to Auto. Set Scale Mode (4) to Manual to change Power Min setting
4	Scale Mode: Defaults to Auto. Change to Manual to change Power Max (1) and Power Min (2) settings
5	Center Marker: Select brings a cursor to the center of the graticule and displays the center (x, y) parameters.

Figure 3-3.   Graticule Power Vs Time Settings

Continuous Mode Numerical Display Area

The Continuous Mode numerical display window contains the following information:
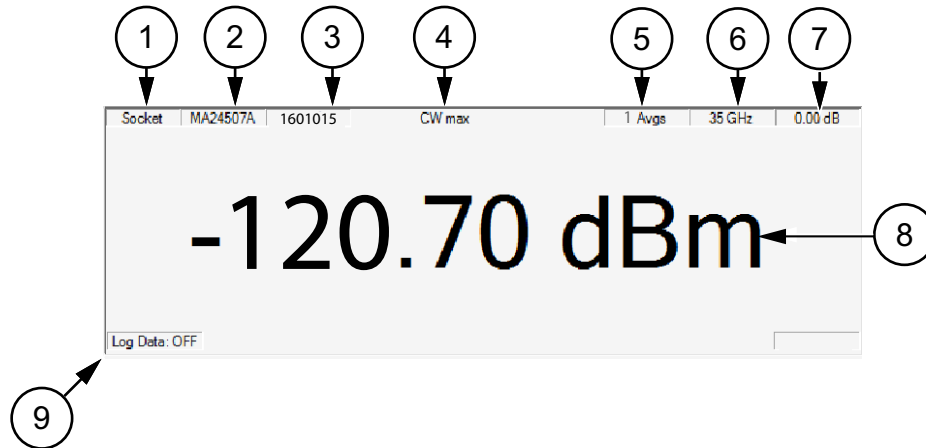
Index	Description
1	Communications port to which the sensor is connected
2	Model number of the connected power sensor
3	Serial number of the connected power sensor
4	Channel power or CW max mode
5	Averaging count
6	Center frequency
7	Fixed offset value
8	Numerical reading with units of measure or task message displayed
9	Data Logging status

Figure 3-4.   PowerXpert Numerical Display Area

3-6   Power Hunter Mode

Power Hunter Mode allows the user to search for up to six CW amplitude peaks within a user-defined frequency span. The Power Hunter Mode display window contains the following information.
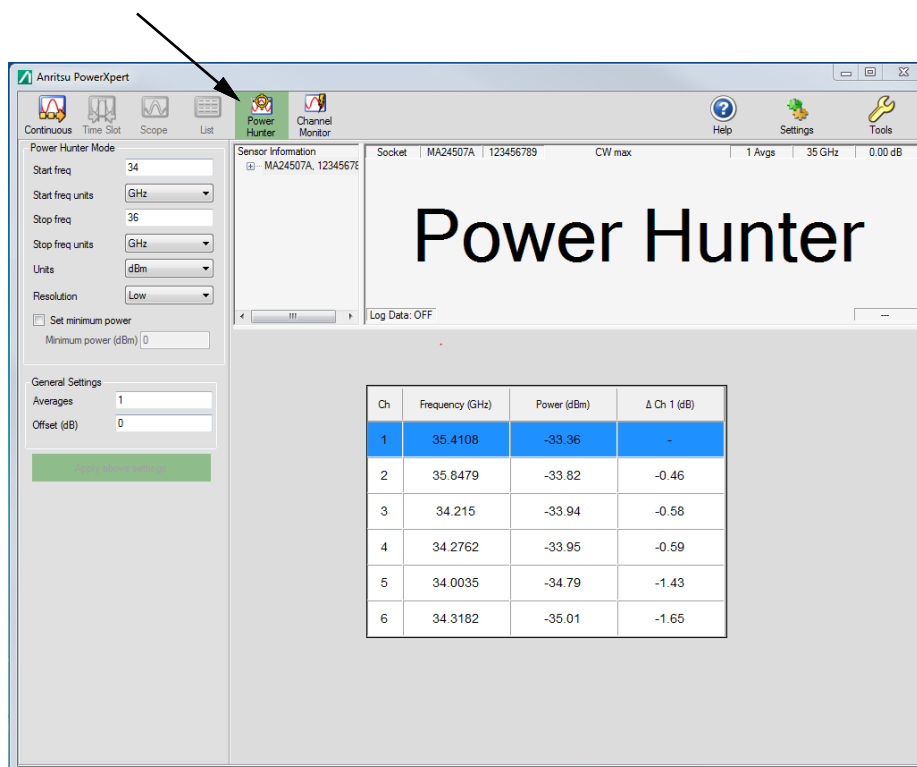
Power Hunter Mode Setting	Options/Range
Start frequency	9 kHz to (70 GHz – 1 kHz)
Stop frequency	10 kHz to 70 GHz
Start / stop freq units	kHz, MHz, GHz
Units	dBm, nW, µW, mW, W
Resolution	Low, Medium, High
Set minimum power	Selected or not
Minimum power	–130 to 0 dBM
General Settings	
Averages	1 to 1000
Offset (dB)	–100 to +150
Apply Above Settings	Select Activates Settings

Figure 3-5.   Power Hunter Mode User Interface Screen

3-7   Power Hunter Settings

Power Hunter mode only supports CW max mode.

Start/Stop Frequency

Start and stop frequencies define the frequency window in which power analyzer will search for CW "peaks". If six sensors are connected, PowerXpert will return the six highest CW values and the associated frequencies.

Start / Stop Freq Units

Select either kHz, MHz, or GHz.

Units

Displays units of power in linear or log scale (dBm, nW, µW, mW, W).

Resolution

Resolution allows the user to choose between optimizing speed or lowering the noise floor. When Resolution is set to "Low", the sensor will make more readings per second, but have a higher noise floor. Conversely, setting Resolution to "High" will lower the noise floor, but the sensor will make fewer readings per second.

Set Minimum Power

Power Hunter allows the user to set a minimum to the power values returned by the sensor. When a minimum power is defined, Power Hunter will only display the CW peaks above that minimum threshold. In the case where there are fewer than six CW peaks, the extra lines will remain blank.

Minimum Power

Provides means to enter in minimum power point. Range is 0 to –130 dBm.

Power Hunter Mode Numerical Display Area

The Power Hunter mode numerical display window contains the following information:
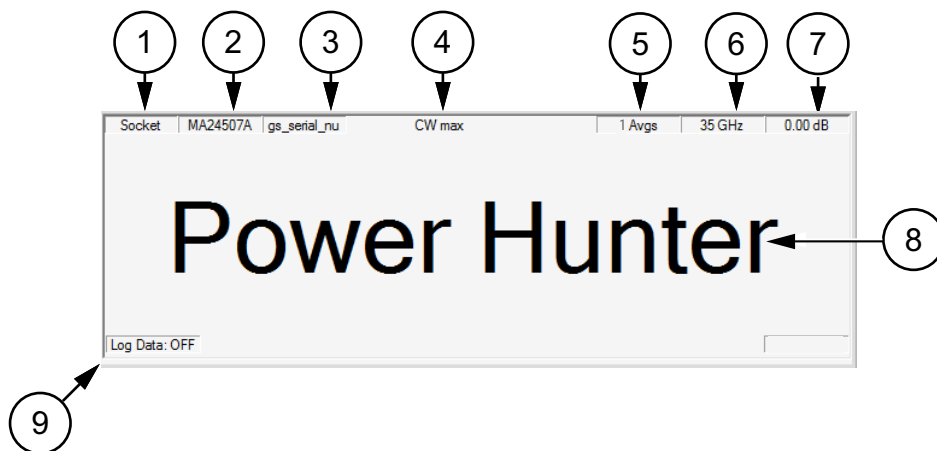
Figure 3-6.   Power Hunter Numerical Display Area

Index	Description
1	Communications port to which the sensor is connected
2	Model number of the connected power sensor
3	Serial number of the connected power sensor
4	CW mode setting (always CW max in Power Hunter mode)
5	Averaging count
6	Center frequency ([stop freq + start freq]/2)
7	Fixed offset value
8	Indicates that PowerXpert is in Power Hunter mode
9	Data Logging status (not available in Power Hunter mode)

Power Reading Display

The power reading window displays the frequency and power for each of the six highest CW peaks within the start and stop frequency range. The delta channel 1 column displays the power difference in dB between each channel and channel 1. The example below displays the six highest peaks detected from a start frequency of 15 GHz swept through to a stop frequency of 19 GHz. Channel (1) detects the highest peak and channels (2) through (6) detects the next highest peaks. The last column displays the measurement delta calculated when referenced to channel (1).

Ch	Frequency (GHz)	Power (dBm)	Δ Ch 1 (dB)
1	17.332	6.74	-
2	16.501	4.08	2.66
3	16.666	3.82	2.92
4	16.167	2.13	4.61
5	15.502	-2.01	8.75
6	15.334	-2.13	8.87

Figure 3-7.   Power Hunter Mode Measurement Display Area

3-8   Channel Monitor Mode

Channel Monitor Mode allows the user to enter up to six different frequencies and monitor power at those frequencies simultaneously. The Channel Monitor display window contains the following information.
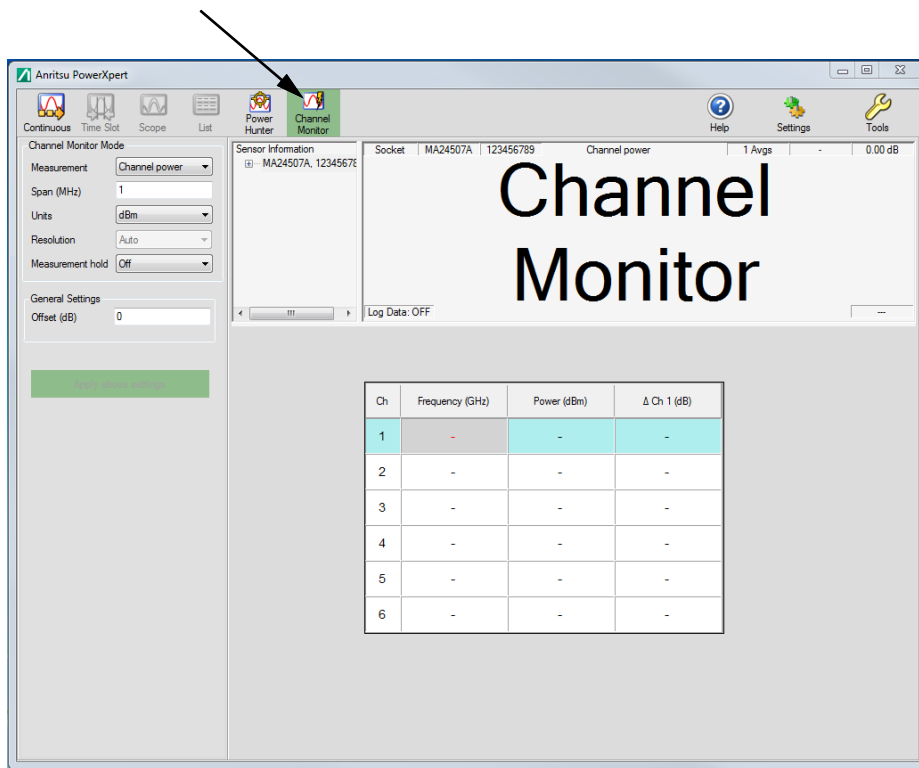
Channel Monitor Mode Setting	Options/Range
Measurement	Channel power / CW max
Span	1 kHz to 20 MHz
Units	dBm, nW, µW, mW, W
Resolution	Low, Medium, High (Available in CW max mode)
Measurement Hold	Off, On
General Settings	
Offset (dB)	−100 to +150
Apply Above Settings	Select Activates Settings

Figure 3-8.   Channel Monitor Mode User Interface Screen

3-9   Channel Monitor Mode Settings

Measurement – CW/Channel Mode

The CW/Channel mode pull down lets you select between Channel Power and CW Max mode. In Channel Power mode, the sensor will calculate the average integrated power across the entire user-defined span. Channel Power mode should be used when measuring average power of modulated signals.

In CW Max mode, the sensor will return the highest CW "peak" amplitude value within the user-defined channel. Note that the "peak" amplitude returned by the sensor is not necessarily at the user-defined center frequency. It is the highest average CW amplitude within the range of center frequency ± span/2.

Span

In Channel Monitor mode, Span works with the frequencies defined in the power reading display area in the same way as it does with the center frequency in Continuous mode. The difference in Channel Monitor mode is that Span is limited to 20 MHz for each frequency channel.

Units

Displays units of power in linear or log scale (dBm, nW, µW, mW, W).

Resolution

Resolution is available when measurement setting is set to CW max. Resolution allows the user to choose between optimizing speed or lowering the noise floor. When Resolution is set to "Low", the sensor will make more readings per second, but have a higher noise floor. Conversely, setting Resolution to "High" will lower the noise floor, but the sensor will make fewer readings per second.

Measurement Hold

When set to On, holds the last sensor readings. When set to Off, the sensor continues to sample measurements.

Channel Monitor Mode Numerical Display Area

The Channel Monitor mode numerical display window contains the following information:
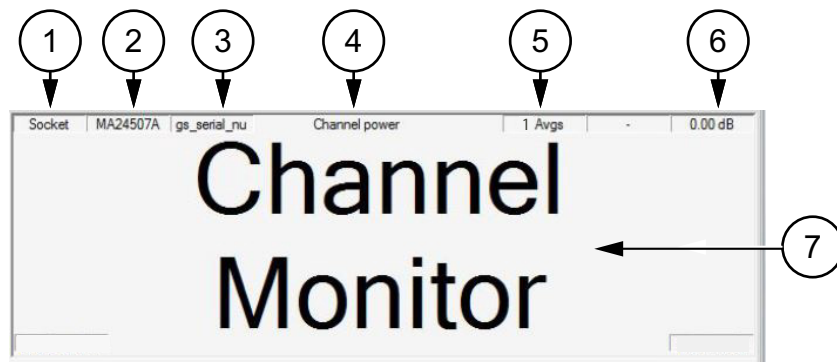
Index	Description
1	Communications port to which the sensor is connected
2	Model number of the connected power sensor
3	Serial number of the connected power sensor
4	Channel/CW mode setting
5	Averaging count
6	Fixed offset value
7	Indicates that PowerXpert is in Channel Monitor mode

Figure 3-9.   Channel Monitor Numerical Display Area

Channel Monitor Display

The Channel Monitor readings display window is where the user enters the center frequencies. To monitor a frequency, simply click on one of the channels, type in the center frequency in GHz, and press enter or click out of the channel. The power will be displayed in the "Power (Units)" column. The user can enter up to six different frequencies. The same span and mode (defined in the left hand menu) will be applied to all channels. The delta channel (1) column displays the calculated difference between each channel to the referenced-channel (1).

Ch	Frequency (GHz)	Power (dBm)	Δ Ch 1 (dB)
1	15	0.03	-
2	16	-0.07	-0.10
3	17	-0.04	-0.07
4	18	-0.03	-0.06
5	19	-0.27	-0.30
6	20	-0.37	-0.40

Figure 3-10. Channel Monitor Mode Measurement Display Area

3-10   Graticule Settings and Graphical Display Area

This section provides a brief overview of the graticule settings and graphical display areas that are presented in the different operating modes of PowerXpert. The Power versus Time graph is used in all modes and provides the ability to plot measured power with respect to time (or time slots). This feature can be used for drift testing, tuning circuits, and for monitoring circuit behaviors to external stimuli. The graph starts automatically and updates continuously in real time.

The following Power versus Time graph is used in "Continuous Mode":

Index	Description
1	Graticule settings area: **Time Span (min):** Sets the current time span setting from 0.1 minutes up to a maximum of 1440 minutes. **Power Max (dBm):** Sets the upper power level for the vertical scale. **Power Min (dBm):** Sets the lower power level for the vertical scale. **Scale Mode:** Sets the vertical scaling to Automatic or Manual (**Power Max (dBm)** and **Power Min (dBm)** settings are not available when set to Automatic). Changes to these settings are applied by pressing the **Enter** key.
2	The vertical scale displays the power level in dBm, regardless of the Units settings of dBm, μW, mW, or W from the "Continuous Mode" settings area.
3	The horizontal scale displays the time in minutes and may be increased or decreased from the graticule settings area. This scale increases up to a maximum of 1440 minutes.
4	Graphical trace display showing the power level as a function of time.
5	Marker showing as a vertical blue line with an x on the marker point and numerical values for the time (in minutes) and power level (in dBm). The marker is available for reading power at an instant of time. It can be dragged with the mouse and can be centered in the display via the **Center marker** button.

Figure 3-11. PowerXpert Graphical Display Area (Continuous Average Mode)

3-11   Sensor Information Area

When using multiple power sensors along with the MA25407A Power Master power analyzer, the parameters and numerical and graphical displays are associated with the selected sensor from the Sensor Information area. See Figure 3-12. When multiple sensor's serial numbers are displayed, click on the serial number to view. When removing a power analyzer or power sensor, disconnect the device's USB connection at the Computer USB port. Other power analyzer and power sensors will remain active until they are removed in the same way.

Note	A MA24507A Power Master can be connected at the same time as a MA242xxA and MA243xxA USB power sensor, see "Show Multiple Sensor Display" on page 3-21, but multiple MA24507A Power Masters on the same PC is currently not supported.
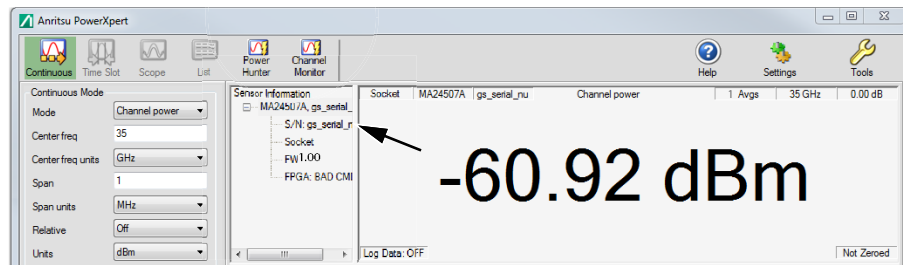
Figure 3-12. Selecting an analyzer or power sensor

Zero Sensor

Zeroing is not necessary for the MA24507A Power Master. When selecting Multiple Analyzer Display, see "Show Multiple Sensor Display" on page 3-21 from the Tools menu, "Tools Menu" on page 3-18 it will be necessary to Zero the MA24208A, MA24218A, MA24330A, MA24340A, and the MA24350A USB power sensors before making measurements.

For detailed information on Zeroing the USB power Sensors, refer to the latest USB Power Sensor with PowerXpert User Guide – 10585-00020, available at:.http://www.anritsu.com.

Averages

The Averages setting allows you to specify the number of measurements that are averaged to calculate the displayed power. A setting of 1 disables averaging.

Offset

A fixed value (in dB) specified by the user is applied as a power offset to the sensor. A positive offset adds a value to the power readings and can be used to compensate for attenuators, couplers, limiters, and other lossy devices. A negative value subtracts a value from the power reading and can be used to compensate for amplification in the measurement path.

Apply Above Settings Button

The Apply Above Settings button applies all changes made to the settings. Changes to these settings do not take affect until clicking this button.

3-12   Tools Menu

The Tools menu provides the option of zeroing all sensors, capturing the PowerXpert screen display, enabling the log data. The grayed out selections are not available with the MA24507A Power Master, but become available when a MA24208A, MA24218A, MA24330A, MA24340A, or MA24350A power sensor is connected and selected. Refer to the latest USB Sensor with PowerXpert User Guide – 10585-00020 when using the other USB power sensor features.
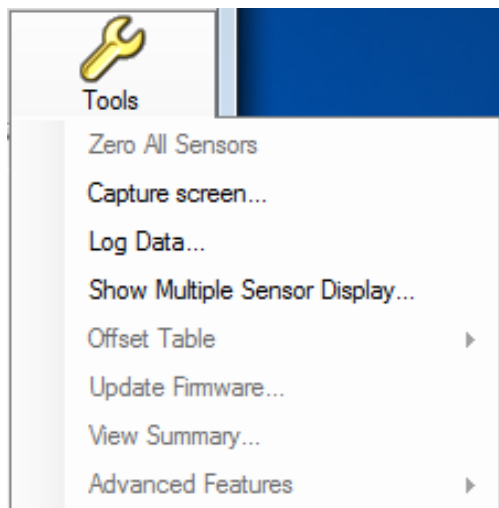
Figure 3-13. Tools Menu

Zero All Sensors

Note	The MA24507A Power Master power analyzer does not require to be Zeroed; therefore, Zero All Sensors is grayed out. But when the MA24208A, MA24218A, MA24330A, MA24340A, and the MA24350A USB power sensors are connected, the Zero All Sensors feature will become active. See "Zero Sensor" on page 3-17

Zero All Sensors provides a convenient method of zeroing all connected power sensors. Zero the MA24208A, MA24218A, MA24330A, MA24340A, and the MA24350A sensors before making power measurements. Zero All Sensors becomes active when a MA24208A, MA24218A, MA24330A, MA24340A, and / or a MA24350A is connected and selected from the "Sensor Information Area" on page 3-17 or "Show Multiple Sensor Display" on page 3-21.

If frequent low-level measurements are being made, it is advised to often check the sensor zeroing to assure accurate measurements. Before zeroing the sensor, connect it to the DUT (device under test) test port and remove RF power from the connection to a level 20 dB below the noise floor of the power sensor. Leave the sensor connected to the DUT test port so that ground noise and thermal EMF (electro-magnetic fields) are zeroed out of the measurement. The sensor may also be connected to a grounded connector on the DUT.

Capture Screen

The Capture Screen utility captures a PowerXpert screenshot and launches the Save image dialog that allows you to save the image in BMP, JPEG, PNG, or GIF file formats.
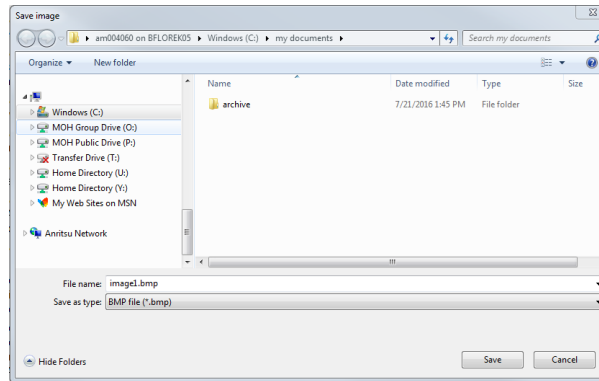
Figure 3-14. Save Image Dialog

Log Data

The Log Data feature provides the ability to record data in a comma separated value file and is accessed from the **Tools | Log Data** toolbar. This feature is available only when the application is in Continuous Average mode. Data logging is set up in the dialog below:
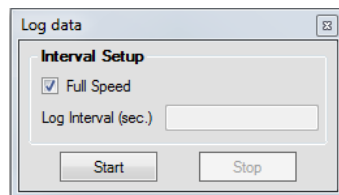
Figure 3-15. Log Data Dialog

- **Interval Setup:** Sets full speed data or fixed interval data logging (user defined logging interval). When Full Speed is selected, the user must manually start and stop the logging function.
- **Log Interval (sec.):** Sets the time interval in which to log data and is available when Full Speed is deselected.

Note	Log Interval should be set to reduce the number of data points when capturing long time periods as Microsoft Excel has a limitation of data records.

Data is stored as comma separated value (.csv) files that can be directly opened in Microsoft Excel. The filename and location can be selected or changed as desired. The default filenames have the following format:

    Test_yyyy_mm_dd_hhmmss.csv

where:

- **yyyy:** Four-digit year
- **mm:** One- or two-digit month
- **dd:** One- or two-digit day
- **hhmmss:** Two digit hours (24-hour clock), minutes, and seconds

Sample log data is shown in a Microsoft Excel spreadsheet file below:

	A	B	C	D	E
1	Initial setup information				
2	Sensor Model	MA24218A			
3	Sensor Serial No	204			
4	Frequency	2	GHz		
5	Fixed Offset	0	dB		
6	Enhanced Modulation	ON			
7	Sample Interval	Full Speed			
8	Any setup information is not updated during data logging.				
9	15:55:11	-16.712	dBm		
10	15:55:11	-16.691	dBm		
11	15:55:11	-16.696	dBm		
12	15:55:11	-16.75	dBm		
13	15:55:11	-16.744	dBm		
14	15:55:11	-16.704	dBm		
15	15:55:11	-16.731	dBm		
16	15:55:11	-16.748	dBm		
17	15:55:11	-16.749	dBm		
18	15:55:11	-16.68	dBm		
19	15:55:12	-16.796	dBm		
20	15:55:12	-16.76	dBm		
21	15:55:12	-16.747	dBm		
22	15:55:12	-16.626	dBm		
23	15:55:12	-16.74	dBm		

Figure 3-16. Log Data Enhanced Modulation On

Data logging is stopped by accessing the **Tools | Log Data** toolbar and pressing **Stop** in the Log data dialog.

	A	B	C	D	E
1	Initial setup information				
2	Sensor Model	MA24218A			
3	Sensor Serial No	204			
4	Frequency	2	GHz		
5	Fixed Offset	0	dB		
6	Sample Interval	Full Speed			
7	Any setup information is not updated during data logging.				
8	15:54:19	-30.409	dBm		
9	15:54:19	-30.478	dBm		
10	15:54:19	-30.494	dBm		
11	15:54:19	-30.446	dBm		
12	15:54:19	-30.403	dBm		
13	15:54:19	-30.429	dBm		
14	15:54:19	-30.427	dBm		
15	15:54:19	-30.391	dBm		
16	15:54:19	-30.417	dBm		
17	15:54:20	-30.428	dBm		
18	15:54:20	-30.365	dBm		
19	15:54:23	-30.412	dBm		
20	15:54:24	-30.463	dBm		
21	15:54:24	-30.435	dBm		
22	15:54:24	-30.382	dBm		
23	15:54:24	-30.398	dBm		
24	15:54:24	-30.404	dBm		

Figure 3-17. Log Data Enhanced Modulation Off

Show Multiple Sensor Display

PowerXpert provides a Multiple Sensor Display screen that shows simultaneous measurements of up to eight sensors. This display is in addition to the normal PowerXpert display and is enabled by clicking **Tools | Show Multiple Sensor Display**. Average power measurements are displayed when in Continuous Mode for the MA24507A power analyzer and the MA241xxA, MA242xxA and MA243xxA USB power sensors.

Note	Only one MA24507A Power Master power analyzer can be connected to a PC at a time, but one MA24507A Power Master power analyzer can be used with multiple other Anritsu USB power sensors, such as the MA241xxA, MA242xxA and MA243xxA USB power sensors.
	There are settings available only to the USB power sensors. Refer to the latest USB Sensor with PowerXpert User Guide – 10585-00020 for detailed information using the MA241xxA, MA242xxA and MA243xxA USB power sensors.

The Multiple Sensor Display provides an active sensor status. See Figure 3-18. This display shows three devices connected. The top display shows a MA24118A power sensor is connected and is in Scope Mode, (Not available for the MA24507A power analyzer). The next two readouts show the average power measurements when in Continuous Mode by a MA24507A and the MA24350A.
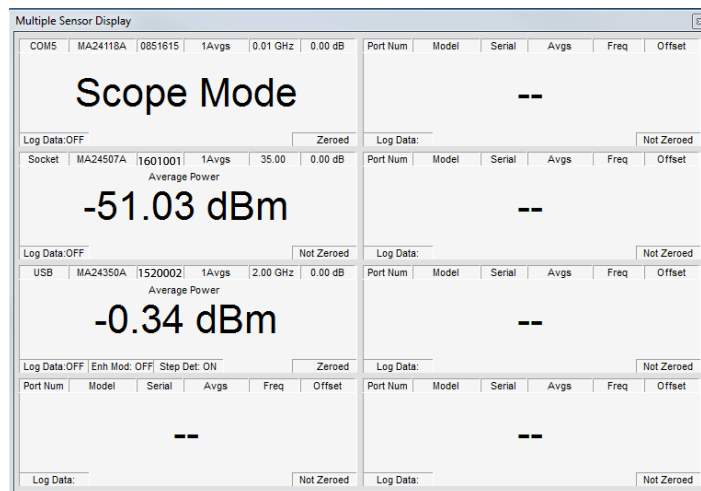
Figure 3-18. Multiple Sensor Display

The settings displayed in each measurement window apply to that sensor or power analyzer. To change a device's settings, access that sensor or power analyzer by going to the Sensor Information menu and select the sensor serial number of the device. Refer to Figure 3-19.
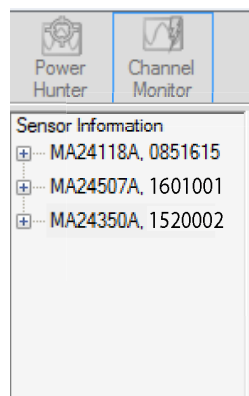
Figure 3-19. Sensor Model and Serial Number Information

3-13   Settings Menu

The Settings menu provides Reset to Factory Settings. The Save/Recall Setup, Set Sensor Time Out, and Secure Mode are inactive at this time and will appear grayed out. The grayed out selections are not available with the MA24507A Power Master, but become available when a MA24208A, MA24218A, MA24330A, MA24340A, or MA24350A power sensor is connected from "Show Multiple Sensor Display" on page 3-21.
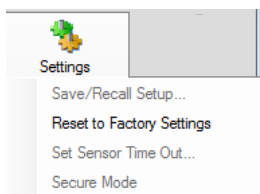
Figure 3-20. Settings Menu

Resetting to Factory Settings

This selection resets the PowerXpert settings to the default state.

No Sensor Display

Figure 3-21. No Sensor Connected

A No Sensor message will display when PowerXpert does not recognize a power analyzer or sensor connection. If this occurs:

1. Close the application and disconnect the power analyzer or sensor.

2. Open the PowerXpert application and reconnect the power analyzer or power sensor.

3. If the problem persists, contact an Anritsu service center.

3-14   Help

The Help menu provides options to launch the online documentation and provides an informational About dialog.
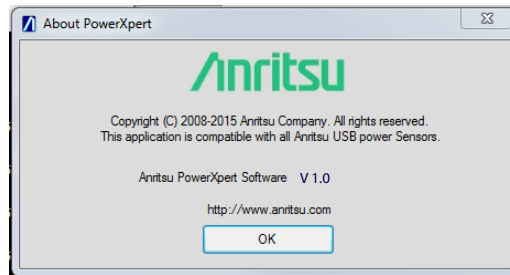
Figure 3-22. About PowerXpert

Chapter 4 — Power Analyzer Care

4-1 Introduction

Anritsu Power analyzers are high quality precision laboratory instruments and should receive the same care and respect afforded such instruments. Follow the precautions listed below when handling or connecting these devices. Complying with these precautions will guarantee longer component life and less equipment downtime due to connector or device failure. This will ensure that USB power sensor and USB power analyzer failures are not due to misuse or abuse – two failure modes not covered under the Anritsu warranty.

Warning	Beware of destructive pin depth of mating connectors.

Based on RF components returned for repair, destructive pin depth of mating connectors is the major cause of failure in the field. When an RF component connector is mated with a connector having a destructive pin depth, damage will usually occur to the RF component connector. A destructive pin depth is one that is too long with respect to the reference plane of the connector (see Figure 4-1 on page 4-6).

Warning	Beware of RF components that may not have precision type connectors.

The center pin of a precision RF component connector has a precision tolerance measured in mils (1/1000 inch). The mating connectors of various RF components may not be precision types. Consequently, the center pins of these devices may not have the proper pin depth. The pin depth of DUT connectors should be measured to assure compatibility before attempting to mate them with power analyzer connectors. An Anritsu Pin Depth Gauge (Figure 4-2 on page 4-7), or equivalent, can be used for this purpose.

4-2 Power Analyzer Precautions

Avoid Over Torquing Connectors

Over torquing connectors is destructive; it may damage the connector center pin. A torque wrench (12 lbf·in or 1.35 N·m) is recommended for tightening N connectors. Always use a torque wrench (8 lbf·in or 0.90 N·m) for K type and V type connectors. Never use pliers to tighten connectors. Refer to Section 4-4 "Connection Techniques" on page 4-3 for detailed instructions.

Avoid Mechanical Shock

Power analyzers are designed to withstand years of normal bench handling. However, do not drop or otherwise treat them roughly. Mechanical shock will significantly reduce their service life.

Avoid Applying Excessive Power

Exceeding the specified maximum input power level will permanently damage the power analyzer internal components and render it useless.

Observe Proper ESD Precautions

Power analyzers contain components that can be destroyed by electrostatic discharge (ESD). Therefore, power analyzers should be treated as ESD-sensitive devices. To prevent ESD damage, do not handle, transport or store a power analyzer except in a static safe environment. A static control wrist strap MUST be worn when handling the power analyzer. Do not use torn or punctured static-shielding bags for storage of power analyzers. Do not place any paper documents such as instructions, customer orders or repair tags inside the protective packaging with the power analyzers.

Clean the Connectors

The precise geometry that makes the RF component's high performance possible can easily be disturbed by dirt and other contamination adhering to the connector interfaces. When not in use, keep the connectors covered. Connectors must be cleaned using a lint-free cotton swab that has been dampened with Isopropyl alcohol (IPA). Refer to Section 4-6 "Connector Cleaning" on page 4-8 for specific details.

Avoid Damage to Communication Connector and Cable

Use care when connecting the USB cable to the power analyzer. Ensure it is properly secured to avoid damage from connector movement while in its receptacle.

4-3   RF Connector Precautions

Handle With Care

RF connectors are designed to withstand years of normal bench handling. However, do not drop or otherwise treat them roughly. They are laboratory-quality devices, and like other such devices, they require careful handling.

Keep Connectors Clean

Avoid touching connector mating planes with bare hands. Natural skin oils and microscopic dirt particles are very hard to remove.

When using cotton swabs to clean connectors, make sure that you don't damage the center conductor. Refer to Section 4-6.

Check the Pin Depth

Always check the pin depth of a new connector before use to determine if it is out of spec. One bad connector can damage many. The connector can be damaged by turning in the wrong direction. Turning right tightens and turning left loosens.

Teflon Tuning Washers

The center conductor on some RF components contains a small teflon tuning washer located near the point of mating (interface). This washer compensates for minor impedance discontinuities at the interface. The washer's location is critical to the RF component's performance. *Do not disturb it.*

Align Before Connecting

To avoid center conductor damage, ensure the connectors you are joining are properly aligned.

Torque Properly

Over torquing connectors is destructive; it may damage the connector center pin. *Never* use pliers to tighten connectors. Always use the correct torque wrench to tighten RF connectors.

Cover the Connectors

Put ESD-safe dust caps on the connector after use.

Store Properly

Never store adapters loose in a box, in a desk, or in a drawer.

4-4   Connection Techniques

Connection Procedure

Table 4-1 lists the Anritsu Company torque wrench and open end wrench part numbers for connectors used on USB power sensors and power analyzers.

Table 4-1.   Connector Wrench Requirements – Torque Wrenches and Settings – Open End Wrenches

Connector Type	Torque Wrench Model Number	Torque Specification	Open End Wrench
V (1.85 mm)	01-201	8 lbf·in (0.90 N·m)	01-204

Connecting

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 while pushing them together. As the center conductors mate, there is usually a slight resistance.

3. Finger tighten the connection by turning the connector nut.

    Do not turn the connector body.

    Do not pre-tighten so much that there is no rotation of the nut when using the torque wrench.

4. Back off the connection by turning the connector nut counter clockwise 1/4 turn.

    The final tightening will be done using the torque wrench.

Torquing

1. Hold torque wrench at the end.

Caution	Holding the torque wrench elsewhere applies an unknown amount of torque and could damage contacts and/or connectors.

2. Rotate *only* the connector nut as you tighten the connector.

    Use an open-end wrench to keep the body of the connector from turning.

3. Keep the two wrenches at a relative angle of less than 90°.

    Using an angle greater than 90° causes the connector devices to lift up and tends to misalign the devices and stress the connectors. This becomes more of a problem when there are several devices connected to each other.

4. Tighten the connection until the torque wrench handle just "breaks". (A typical torque wrench has a calibrated spring-hinged handle. "Breaking" means the force on the handle overcomes the spring pressure at the hinge and the handle begins to fold at the hinge point).

    Breaking the handle fully can cause the wrench to kick back and may loosen the connection.

Disconnection Procedure

1. Use an open end wrench to prevent the connector body from turning.

2. Use another wrench to loosen the connector nut.

3. Complete the disconnection by hand, turning *only* the connector nut.

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

4-5   RF Connector Preventive Care

Most coax connectors are assembled into a system and forgotten, but some, especially on test equipment are used almost continuously. The care and cleaning of these connectors is critical to accurate and reliable performance. Remember that all connectors have a limited life time and usually a maximum connect/disconnect specification, typically about 5,000 connections. Most will last well beyond this number, but poor usage and poor care can destroy a connector well before that number. Good connector performance can be achieved with the following:

- Periodic visual inspection
- Appropriate gauging techniques
- Proper connection and disconnection techniques using torque wrench
- Proper cleaning

Visual Inspection

To ensure a long and reliable connector life, careful visual inspection should be performed on the connectors before they are used on a particular job at a minimum of once per day when the item is being used. A "good" connector may get damaged if it is mated with a "bad" one.

Magnification

The minimum magnification for connector inspection for damage varies with the connector:

- V (1.85 mm)) connectors

Any connector with the following defects should be repaired or discarded:

Plating

- Deep scratches showing bare metal on the mating plane
- Bubbles and blisters

The connectors may lose some gloss over time due to usage. Light scratches, marks and other cosmetic imperfections can be found on the mating plane surfaces. These should be of no cause for concern.

Threads

- Damaged threads. Don't force the connectors to mate with each other if the threads are damaged.

Center conductors

- Bent, broken or damaged contacts.

Pin Depth Measurement

Precautions

Warning	Beware of destructive pin depth of mating connectors.

A connector should be checked before it is used a minimum of once per day. If the connector is to be used on another item of equipment, the connector on the equipment to be tested should also be gauged.

Connectors should never be forced together when making a connection since forcing often indicates incorrectness and incompatibility. There are some dimensions that are critical for the mechanical integrity, non-destructive mating and electrical performance of the connector. Connector gauge kits are available for many connector types. Please refer to Anritsu Application Note 10200-00040. The mechanical gauging of coaxial connectors will detect and prevent the following problems:

Positive Pin Depth

Positive pin depth can result in buckling of the fingers of the female center conductor or damage to the internal structure of a device due to the axial forces generated.

Caution	Never make a connection when any positive pin depth condition exists.

Negative Pin Depth

Negative pin depth can result in poor return loss, possibly unreliable connections, and can even cause physical breakdown of the connection under peak power conditions.

Checking the Pin Depth Gauge

Pin depth gauges should be checked for cleanliness before they are used at a minimum of once per month. Connector cleaning procedures (refer to Section 4-6) can also be used to clean the pin depth gauges.

Pin Depth Dimensions

Based on RF components returned for repair, destructive pin depth of mating connectors is the major cause of failure in the field. Before mating, measure the pin depth of the device that will mate with the RF component. The dimensions measured are shown in Figure 4-1. When an RF component is mated with a connector having a destructive pin depth, damage will likely occur to the RF component connector.
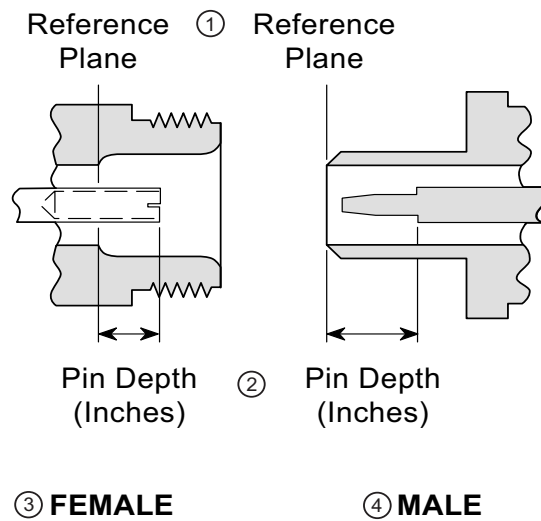
Index	Description
1	Reference Plane
2	Pin Depth (Inches)
3	Female
4	Male

Figure 4-1.   Connector Pin Depth

Pin Depth Gauge

Use an Anritsu Pin Depth Gauge or equivalent as shown in Figure 4-2 to accurately measure pin depths.

Note	A destructive pin depth has a center pin that is too long in respect to the connector's reference plane.
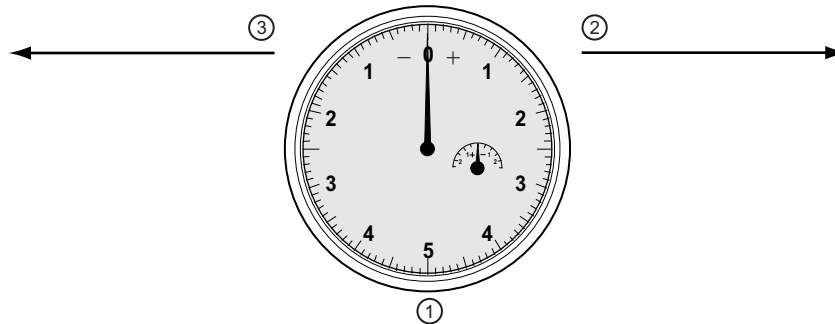
Index	Description
1	Pin Depth Gauge with needle setting at zero
2	Positive needle direction clockwise to right
3	Negative needle direction counter-clockwise to left

Figure 4-2.   Pin Depth Gauge

Pin Depth Tolerances

The center pin of RF component connectors has a precision tolerance measured in "mils" which is equal to 1/1000 inch (0.001") or approximately 0.02540 mm.

Connectors on test devices that mate with RF components may not be precision types and may not have the proper depth. They must be measured before mating to ensure suitability and to avoid connector damage.

When gauging pin depth, if the test device connector measures out of tolerance in the "+" region of the gauge (see Table 4-2), the center pin is too long. Mating under this condition may damage the termination connector.

On the other hand, if the test device connector measures out of tolerance in the "−" region, the center pin is too short. While this will not cause any damage, it will result in a poor connection and degradation in performance.

Table 4-2.   Pin Depth Tolerances and Gauge Settings for USB power analyzer Connectors

Connector Type	Pin Depth (in) (min/max)	Anritsu Gauge Setting (min/max)
V Male	+0.000	Same as pin depth
V Female	−0.004	

1. Type N connectors use a zero gauge block when measuring pin depth. The gauge block is used to zero the gauge before the measurement. Type N gauge blocks have an offset of plus or minus 0.207 depending upon the sex.

2. Actual pin depth measured is −0.207 when the gauge dial indicates 0.000.

3. Actual pin depth measured is +0.207 when the gauge dial indicates 0.000.

4-6   Connector Cleaning

Connector interfaces should be kept clean and free of dirt and other debris. Clean connectors with lint-free cotton swabs. Isopropyl alcohol is the recommended solvent. Figure 4-3 on page 4-9 illustrates the cleaning procedures for male and female connectors.

Note	Most cotton swabs are too large to fit into the ends of the smaller connector types. In these cases it is necessary to peel off most of the cotton and then twist the remaining cotton tight. Be sure that the remaining cotton does not get stuck in the connector.

With continuous use, the outer conductor mating interface will build up a layer of dirt and metal chips that can severely degrade connector electrical and mechanical performance. It can also increase the coupling torque which can damage the mating interface. Cleaning connectors is essential for maintaining good electrical performance so check them for cleanliness before making any measurements (or calibration).

Required Cleaning Items

- Low pressure compressed air (solvent free)
- Lint-free cotton swabs
- Isopropyl alcohol (IPA)
- Microscope

Important Cleaning Tips

Use the following important tips when cleaning connectors:

- Compressed air may be used to remove foreign particles and to dry the connector.
- Inspect after cleaning to verify that the center pin has not been bent or damaged.

Cleaning Procedure

1. Remove loose particles on the mating surfaces, threads, and similar surfaces using low-pressure compressed air.

2. The threads of the connector should be cleaned with a lint-free cotton swab. When connector threads are clean, the connection should hand-tighten to within approximately one-half turn of the specified torque. In other words, when using a torque wrench, a clean connector should only need about a half turn more after hand-tightening to reach specified torque.

3. Clean mating plane surfaces using alcohol on lint-free cotton swabs (Figure 4-3 on page 4-9).

   - Use only lint-free cotton swabs.
   - Use only isopropyl alcohol as a solvent. Do not spray solvent directly onto connector surfaces.
   - Only dampen the cotton swab with solvent. Do NOT saturate it. Use only enough solvent to clean the surface.
   - Make sure that the cotton swab is not too large.
   - Gently move the cotton swab around the center conductor.
   - Never put lateral pressure on the connector center pin.
   - Verify that no cotton strands or other foreign material remain in the connector after cleaning.
   - Use the least possible pressure to avoid damaging connector surfaces.

4. After cleaning with swabs, again use low-pressure compressed air to remove any remaining small particles and to dry the connector surfaces.

5. Inspect the connectors for cotton strands or other debris after cleaning.
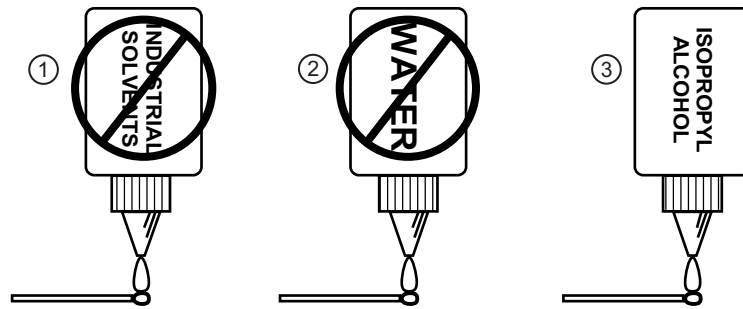
④ Do NOT use Industrial Solvents or Water on connector. Use only Isopropyl Alcohol. Dampen only, DO NOT saturate.
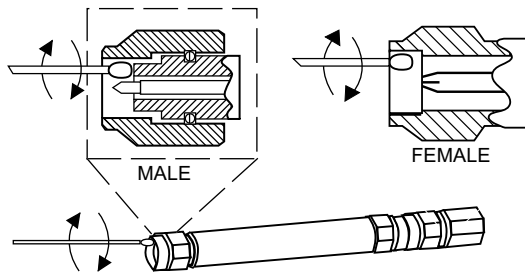
⑤ Use only isopropyl alcohol and the proper size of cotton swab. Gently rotate the swab around the center pin being careful not to stress or bend the pin or you will damage the connector.
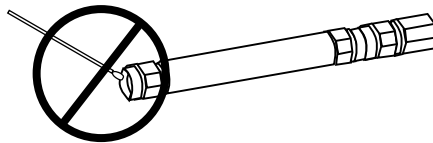
⑥ Do NOT put cotton swabs in at an angle, or you will damage the connectors.
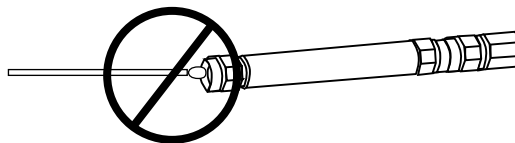
⑦ Do NOT use too large of cotton swab, or you will damage the connectors.

Index	Description
1	No industrial solvents
2	No Water
3	Use Isopropyl Alcohol
4	Do NOT use Industrial Solvents or Water on connector. Use only Isopropyl Alcohol. Dampen only, Do NOT saturate.
5	Use only isopropyl alcohol and the proper size of cotton swab. Gently rotate the swab around the center pin being careful not to stress or bend the pin or you will damage the connector.
6	Do NOT put cotton swabs in at an angle, or you will damage the connectors.
7	Do NOT use too large of cotton swab, or you will damage the connectors.

Figure 4-3. Connector Cleaning

Chapter 5 — Using the MA24507A Power Master

5-1   Introduction

This section presents common procedures for using the MA24507A Power Master with a PC. These procedures refer to the MA24507A Power Master and to the Anritsu PowerXpert PC application buttons and menus that were previously described. Before attempting these procedures, you should be familiar with the Anritsu PowerXpert PC application.

Power Master Overview

The MA24507A Power Master is illustrated in the figure below.

MA24507A

Index	Description
	MA24507A Power Master
1	RF input: V male (Torque connector at 8lbf-in [0.9 N.m]).
2	Trigger Port (Inactive)
3	Status LED
4	USB Type C Port (for connection with a PC or Anritsu handheld instrument)
5	Reference Port (for service only)

Figure 5-1.   MA24507A Power Master Connection View

5-2   Basic Power Measurement

1. Connect the power analyzer to a computer as shown in Figure 5-2.

2. Open the Anritsu PowerXpert application.

Warning	**Do not** apply power outside of the power analyzer specifications or permanent damage may result. Connect a fixed attenuator to the output connector when power exceeds +30 dBm.

	Before connecting the power analyzer to another device, ensure the following: • ESD precautions are observed. • Both connectors are in good condition and undamaged. • Pin depth is verified. • Both connectors are clean. • Ensure the output of the device you are connecting to does not exceed the signal limits of the power analyzer. • Refer to Chapter 4, "Power Analyzer Care" for complete details. **When connecting the power analyzer, ensure the following:** • The connectors are aligned before mating. • Do not turn the connector body–only turn the connector coupling nut. • Torque the connection using the correct torque wrench and proper torquing technique. • Do not over torque. • Refer to Chapter 4, "Power Analyzer Care" for complete details.
Caution	

MA24507A

Optional Attenuator

5.15   dBm

Figure 5-2.   Measurement Setup

3. Connect the RF source to the **RF IN** port of the power analyzer. Read the power measurement from the Anritsu PowerXpert application window (power readings are continuous with the default setting).

Connecting the DUT

RF signal connections are made to the male RF connector, which has a 50 ohm characteristic impedance. When connecting to the male connector of the power analyzer, observe the following practice for tightening the connection:

1. While holding the body of the power analyzer in one hand, turn the male connector nut to finger-tighten the connection. **Do not** turn the body of the power analyzer as this will cause excessive wear to the connector.

2. Back off the connection by turning the connector nut counter clockwise 1/4 turn.

3. Tighten the connection (clockwise) using a 8 in-lb torque wrench (Anritsu part number: 01-201).

Zeroing the Power Analyzer

Zeroing the MA24507A Power Master is not required. All calibration factors, as well as temperature corrections, are stored in the power analyzer. Therefore, there is no need for a reference calibration with the Power Master.

5-3 Error States

This section details some of the error messages that may appear on the application screen. In most cases, the error condition can be easily corrected. The status LED for MA24507A Power Master will blink green when an error state occurs. If the error condition cannot be corrected, note the error message and contact an Anritsu Service Center.

Table 5-1. MA24507A Power Master Error Messages

Message	Description	Resolution
Temp Out of Range	The power analyzer is operating outside of its specified range of 0 ºC to 50 ºC.	Operate the power analyzer within its specified range.
REDUCE POWER, Max Power Exceeded	This message appears on the application screen if excess power is applied to the power analyzer.	The maximum input power damage level is +30 dBm. Reduce the input power to the power analyzer to within acceptable limits (< 20 dBm).

Chapter 6 — MA24507A Power Master Operational Testing

6-1 Introduction

The test methodology and equipment described here can be used to gain some confidence in the measurement accuracy of the MA24507A Power Master. This is accomplished by comparing the power analyzer to another power analyzer or power sensor with a specified cal factor and linearity performance or uncertainty. All tests should be performed at an ambient temperature of 25 ºC to 30 ºC.

Note	For calibration, verification, and to maintain the factory specifications of your power analyzer, please send the power analyzer to qualified Anritsu Customer Service Centers.

Refer to the following sections for required equipment and test procedures:

- "Required Equipment"
- "VSWR Pretest"
- "Frequency Response Test"

6-2 Precautions

Warning	**Do not** apply power outside of the power analyzer specifications or permanent damage may result. Connect a fixed attenuator to the output connector when power exceeds +30 dBm.

	Before connecting the power analyzer to another device, ensure the following:
Caution	• Both connectors are in good condition and undamaged • Pin depth is verified • Both connectors are clean • Ensure the output of the device you are connecting to does not exceed the signal limits of the power analyzer • ESD precautions are observed • Refer to Chapter 4, "Power Analyzer Care" for complete details. **When connecting the power analyzer, ensure the following:** • The connectors are aligned before mating • Do not turn the connector body–only the connector coupling nut. • Torque the connection using the correct torque wrench and proper torquing technique. • Do not over torque. • Refer to Chapter 4, "Power Analyzer Care" for complete details.

6-3   Required Equipment

Table 6-1.   Required Equipment for MA24507A Power Master

Equipment Description	Manufacturer and Model	Critical Specifications
Vector Network	Anritsu MS4644B (40 GHz) MS4645B (50 GHz) MS4647B (70 GHz)	Reflection Coefficient UNC $\leq$ 0.012, 50 MHz to 26.5 GHz UNC $\leq$ 0.018, 26.5 to 40 GHz UNC $\leq$ 0.026, 40 to 50 GHz UNC $\leq$ 0.034, 50 to 67 GHz
Synthesizer	Anritsu MG3694C (40 GHz) MG3695C (50 GHz) MG3697C (70 GHz)	Output Power $\geq$ +15 dBm, 50 MHz to 40 GHz Output Power Setting Resolution: 0.01 dBm Harmonics $\leq$ –40 dBc, 50 MHz to 40 GHz Source VSWR $\leq$ 2.0
Reference Power Meter	Rhode Schwarz NRP2	Instrumentation Accuracy $\leq$ 0.5 %
Reference Power Sensor	Rhode Schwarz NRP-Z57 (67 GHz)	NIST Calibration or equivalent
10 dB Attenuator	Anritsu 41KC-10 (40 GHz) 41V-10 (60 GHz)	VSWR ≤1.15, DC to 12 GHz VSWR ≤1.20, > 12 to 18 GHz VSWR ≤1.25, > 18 to 26.5 GHz VSWR ≤1.40, > 26.5 to 40 GHz VSWR ≤1.90, > 40 to 60 GHz
Personal Computer	Any	See Chapter 2
Type V Calibration Kit	Anritsu 3654D	

6-4   VSWR Pretest

The most common cause of power analyzer failure is excess input power. Applying power exceeding the damage level shown on the label will damage the power analyzer's sensing element resulting in impedance change. Input match will be degraded when element impedance is changed. If you suspect that a power analyzer is damaged, you should start with an input match pretest.

Test Procedure

Follow the manufacturer's S11 (input return loss) calibration procedure to perform calibration on the network. Connect the power analyzer to the network test port and measure power analyzer input match. Typically, return loss are expressed in dB, which can be interconverted to Reflection Coefficient and VSWR as follows:

$\rho = 10^{-RL/20}$

$RL = -20\log\rho$

$VSWR = (1 + \rho) / (1 - \rho)$

$\rho = (VSWR - 1) / (VSWR + 1)$

where

RL = Return Loss in dB

ρ = Magnitude of the Reflection Coefficient

VSWR = Voltage Standing Wave Ratio

Record the measured data into Table 6-2 under the Actual Measurement column. The Actual Measurement should be smaller than the Maximum Reflection coefficient. The Maximum Reflection Coefficient is equal to the measurement system uncertainty added to the power analyzer's reflection coefficient specification. If the Actual Measurement reflection coefficient is larger than the Maximum Reflection Coefficient, then the power analyzer may be defective. If the actual reflection coefficient is significantly larger than the maximum values in Table 6-2, then the power analyzer is damaged and it is not necessary to perform further testing.

Note	There are no user-serviceable parts inside the power analyzer. Contact your local Anritsu Service Center and return defective power analyzer with a detailed description of the observed problem.

Table 6-2.   VSWR Pretest Measurement Result

Frequency	Reflection Coefficient Uncertainty	Maximum Reflection Coefficient	Actual Measurement
50 MHz to 12.5 GHz	0.012	0.078+0.012 = 0.09	
12.5 to 26.5 GHz	0.012	0.16+0.012 = 0.172	
26.5 to 40 GHz	0.018	0.2+0.018 = 0.218	
40 to 50 GHz	0.026	0.251+0.026 = 0.277	
50 to 67 GHz	0.034	0.355+0.034 = 0.389	

6-5   Frequency Response Test

In this test the frequency response of the power analyzer is tested at one low power level against a reference power sensor or power analyzer of known measurement uncertainty. The reference power sensor or power analyzer should be calibrated by a reputable standards laboratory using instruments with low published measurement uncertainty values. To perform the comparison, both power sensors or power analyzers are used to measure the output power of a synthesizer with a high quality attenuator at the output. The attenuator improves the source match of the synthesizer by lowering the mismatch ripples, thereby lowering the uncertainty in the comparison.

Test Procedure for MA24507A Power Master

1. Set up the equipment as follows (refer to Figure 6-1 for an illustration and Table 6-1 for the required equipment):

   a. Preset all test equipment.

   b. Reference power sensor and power meter (if needed) Not shown in the Figure 6-1.

   c. Connect the USB cable between the computer and MA24507A Power Master.

   d. Launch the PowerXpert application.

   e. Power up all test equipment for the amount of time specified in their manuals.

   f. Connect the attenuator to the synthesizer with appropriate adapter (if required).

   g. Connect the reference sensor to the attenuator. Turn Off synthesizer RF output.

.
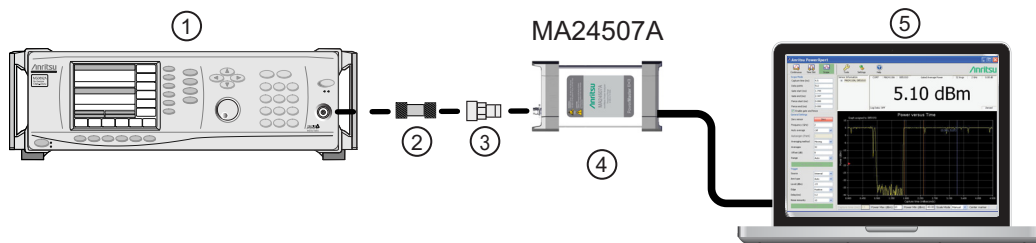
Index	Description
1	Synthesizer
2	10 dB Attenuator
3	Adapter
4	MA24507A Power Master
5	PC with Anritsu PowerXpert Application

Figure 6-1.   MA24507A Power Master Frequency Response Setup

2. Set synthesizer power to 5 dBm and frequency to 50 MHz CW. Turn On RF output.

3. Apply the Cal Factor to the reference sensor.

4. Record the power indicated by the reference meter or virtual power meter software in Table 6-3.

5. Set synthesizer frequency to the next frequency in Table 6-3.

6. Repeat Steps 4 thru 6 until all frequencies are measured.

7. Turn Off RF output. Disconnect the reference sensor and connect MA24507A Power Master to the attenuator.

8. Set synthesizer frequency to 50 MHz CW. Turn On RF output.

9. Set to Continuous Mode: Mode = Channel power, Span = 1MHz, Units =dBm, Range = Upper, Averages = 64

10. Enter test frequency in GHz on PowerXpert.

11. Record the power indicated by the MA24507A Power Master.

12. Set synthesizer frequency to the next frequency.

13. Repeat Steps 12 through 14 until all frequencies are measured.

14. Calculate the absolute difference between the Reference power and MA24507A Power Master measurement.

15. Compare the power difference to the maximum allowed difference specified. If the difference exceeds the maximum allowed difference, contact Anritsu Customer Service.

Table 6-3.   MA24507A Power Master Test Measurement Results

Frequency (GHz)	A Reference Power Measurement (dBm)	B MA24507A Measurement (dBm)	|A-B| Absolute Value of Difference in Power Measurements (dB)	MA24507A Maximum Allowed Difference (dB)
0.05				0.31
1.0				0.29
5.0				0.33
10.0				0.37
20.0				0.62
30.0				0.62
40.0				0.62
50.0				0.62
60.0				0.62
67.0				0.62

Chapter 7 — Remote Operation

7-1 Introduction

This chapter describes the remote programming for the MA24507A Power Master. This chapter contains all of the SCPI commands (required and native) that are implemented in the instrument. The SCPI commands are grouped by their respective subsystems. For each subsystem, the commands described in detail in the listing. The notation corresponds to one of the SCPI standards to a large extent.

Device Driver for MS Windows

The power analyzer device driver .inf file should be installed in Microsoft Windows. The device driver contains the device specific configuration or settings, such as USB Vendor ID (VID) and Product ID (PID), to bring the power analyzer online. The device driver is installed automatically by the PowerXpert installation. To install manually:

1. Open Windows Device Manager by clicking Start and typing "Device Manager" then opening the first result.

2. If the drivers are not already installed, when connected to the PC, the device may show in the Device Manager as "Westbridge" or "Unknown Device". Locate the power analyzer in the Device Manager tree by finding the new entry that is added when the device gets connected to the PC.

3. Right click the device in Windows Device Manager and select Update Driver Software...

4. Click "Browse my computer for driver software".

5. Click "Let me pick from a list of device drivers on my computer".

6. Click "Have Disk..."

7. Browse to and select the device driver appropriate for your PC.

8. Click "Next".

9. Allow the driver to finish installing. Windows User Account Control may ask if you want to install the driver.

10. Click yes.

11. Run Anritsu Device Monitor to automatically load the firmware. You will see a Windows error message stating that the backendloader is incomplete. This is to be expected. At this point, the device will re-enumerate as a different device. The drivers will need to be installed again for this new device. Repeat Step 2 through Step 9

The Device Monitor appears in the system tray and provides the MA24507A Power Master details.
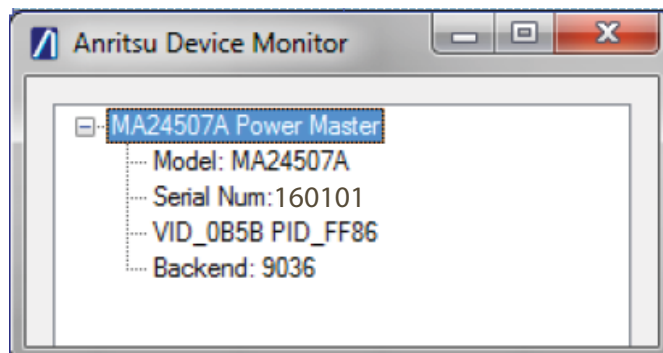

Figure 7-1. Device Monitor

Remote Programming Interface

The MA24507A Power Master utilizes Super Speed USB 3.0 technology for speed and power and communicates using SCPI commands. In order to provide the SCPI interface via TCPIP socket, the Anritsu Device Monitor must be running on the PC where the device is connected. The Anritsu Device Monitor will recognize when the device is plugged in and launch the necessary background software automatically.

Applications may handle the network socket communication themselves and control the MA24507A Power Master using the SCPI command set. The IP address of the instrument is the IP address of the PC to which the power analyzer is physically connected. If the software is running on the same PC, then the address would be "localhost" or 127.0.0.1, and the network socket port number used by MA24507A Power Master is 9001. The MA24507A Power Master can also be controlled remotely using National Instruments VISA using TCPIP mode.

7-2   IEEE 488.2 Commands

The IEEE-488.2 commands are defined in the IEEE-488.2 standard and must be implemented by all SCPI compatible instruments. The mandated commands listed in Table 7-1 are identified by the asterisk (*) at the beginning of the command keyword. These commands are used to control instrument status registers, status reporting, synchronization, and other common functions.

Table 7-1.   IEEE 488.2 Mandated Commands

*CLS	*IDN?	*RST	STB?
*ESE	*OPC	*SRE*	*WAI
*ESE?	*OPC?	SRE?	
*ESR?			

7-3   Command Requirements

Query Commands

All commands, unless specifically noted in the commands syntax descriptions, have a query form. As defined in IEEE-488.2, a query is a command with a question mark symbol appended: (examples: `*IDN?`)
When a query form of a command is received, the current setting associated with the comm and is placed in the output buffer. Query commands always return the short form of the parameter unless otherwise specified. Boolean values are returned as `1` or `0`, even when they can be set as `on` or `off`.

Data Parameters

Data parameters, referred to simply as "parameters," are the quantitative values used as arguments for the command keywords. The parameter type associated with a particular SCPI command is determined by the type of information required to control the particular instrument function. For example, Boolean (ON | OFF) type parameters are used with commands that control switch functions.

Some command descriptions specify the type of data parameter to be used with each command. The most commonly used parameter types are numeric, extended numeric, discrete, and Boolean.

Numeric

Numeric parameters comprise integer numbers or any number in decimal or scientific notation, and may include polarity signs. This includes <NR1>, <NR2>, and <NR3> numeric data as defined in "Data Parameter Notations" below.

Extended Numeric

Extended numeric parameters include values such as MAXimum and MINimum.

Discrete

Discrete parameters, such as INTernal and EXTernal, are used to control program settings to a predetermined finite value or condition.

Boolean

Boolean parameters represent binary conditions and may be expressed as ON, OFF or 1, 0.

Data Parameter Notations

The following syntax conventions are used for data parameter descriptions in this manual:

Table 7-2. Parameter Notations

<arg>	::=a generic command argument consisting of one or more of the other data types
<bNR1>	::=boolean values in <NR1> format; numeric 1 or 0
<boolean>	::=ON | OFF. Can also be represented as 1 or 0, where 1 means ON and 0 means OFF Boolean parameters are always returned as 1 or 0 in <NR1> format by query commands
<integer>	::=an unsigned integer without a decimal point (implied radix point)
<NR1>	::=a signed integer without a decimal point (implied radix point)
<NR2>	::=a signed number with an explicit radix point
<NR3>	::=a scaled explicit decimal point numeric value with and exponent (e.g., floating point number)
<NRf>	::=<NR1>|<NR2>|<NR3>
<numeric_value>	::=SCPI numeric value: <NRf>|MINimum|MAXimum|UP|DOWN|DEFault|NAN (Not A Number)|INFinity|NINFinity (Negative Infinity) or other types
<char>	::=<CHARACTER PROGRAM DATA> Examples: CW, FIXed, UP, and DOWN
<string>	::=<STRING PROGRAM DATA> ASCII characters enclosed by double quotes. For example: "OFF"
<block>	::=IEEE-488.2 block data format
<NA>	::=Not Applicable

Unit Suffixes

Unit suffixes are not required for data parameters, provided the values are scaled for the global default units. The instrument SCPI default units are:

- Hz (Hertz) for frequency related parameters
- s (seconds) for time related parameters
- m (meters) for distance related parameters
- dB relative power value
- dBm absolute power value

7-4   Notational Conventions

The SCPI interface standardizes command syntax and style that simplifies the task of programming across a wide range of instrumentation. As with any programming language, the exact command keywords and command syntax must be used. Unrecognized commands or improper syntax will not function.

Table 7-3.   Notational Conventions

:	A colon links command keywords together to form commands. The colon is not an actual part of the keyword, but is a signal to the SCPI interface parser. A colon must precede a root keyword immediately following a semicolon.
;	A semicolon separates commands if multiple commands are placed on a single program line.
[ ]	Square brackets enclose one or more optional keywords.
{ }	Braces enclose one or more keyword or command parameters that may be included one or more times.
|	A vertical bar indicates "or" and is used to separate alternative parameter options. Example: ON | OFF is the same as ON or OFF.
< >	Angle brackets enclose parameter descriptions.
::=	Means "is defined as" For example: <a>::=<b><c> indicates that <b><c> can replace <a>.
sp	Space, referred to as *white space*, must be used to separate keywords from their associated data parameters. It must not be used between keywords or inside keywords.
XXX	Indicates a root command name

For further information about SCPI command syntax and style, refer to the Standard Commands for Programmable Instruments (SCPI) 1999.0 document.

7-5   Programming the MA24507A Power Master

Send and Receive Format

Every network socket communication with the power analyzer must be suffixed with the line feed (*LF*) character (ASCII 0x0A). Every response from the power analyzer is also suffixed with the same character (except when using Microsoft HyperTerminal, which uses a carriage return as the identifier). The power analyzer will not respond to any commands until it receives a line feed character. All commands and responses mentioned in this document are assumed to be suffixed with a new line character. The following considerations must also be observed:

- Command arguments presented in this document are enclosed in angle brackets: <argument>. The angle brackets are not included as part of the actual argument.
- Floating point numbers are truncated to integers by commands that only use integers as input. For example, if the number of averages is set as 2000.937, the value is truncated to 2000.

Error Responses

When using network socket communication and SCPI commands, any unrecognized command will be ignored and a message will be added to the error queue. Error messages can be read and removed from the queue using the SYST:ERR? query.

Default Power Analyzer Settings

The power analyzer settings in Table 7-4 apply to the MA24507A Power Master.

Table 7-4.   General Default Settings

Setting	Command	Default Value
Average Count	`[:SENSe]:AVERage:COUNt`	10
Average State	`[:SENSe]:AVERage:STATe`	0
Center Frequency	`[:SENSe]:FREQuency:CENTer`	35,000,004,500
Channel Power State	`[:SENSe]:CHPower:STATe`	0
Channel Width	`[:SENSe]:FREQuency:CHWidth`	69,999,991,000
CW Max Count	`:CALCulate:CWMax:COUNt`	1
CW Max Threshold Level	`:CALCulate:CWMax:THReshold`	0
CW Max Threshold State	`:CALCulate:CWMax:THReshold:STATe`	0
Preamp State	`[:SENSe]:POWer:RF:GAIN:STATe`	0
Relative Mode	`[:SENSe]:POWer:RELative`	0
Resolution	`[:SENSe]:RESolution[?]`	LOW
Sweep Type	`:INITiate:CONTinuous`	1

7-6   System Common Commands

The set of system common commands are primarily used to control the state of the instrument for system diagnostics, hardware calibration, and troubleshooting.

*CLS

Title:	Clear Status Command
Description:	This command clears all status data structures in the device (registers and error queue) and forces the Operation Complete state to Idle.

*ESE <NR1>
*ESE?

Title:	Standard Event Status Enable
Description:	This command provides access the Standard Event Status Enable Register. Refer to IEEE 488.2 for more information on the contents of this register.
Parameters:	<NR1>
Query Output:	<NR1>
Range:	0 to 255

*ESR?

Title:	Standard Event Status
Description:	This command queries the Standard Event Status Register. Refer to IEEE 488.2 for more information on the contents of this register.

*IDN?

Title:	Identification Query
Description:	This command returns the following information in <string> format separated by commas: manufacturer name ("Anritsu"), model number, serial number, firmware package number. The model number and options are separated by a "/" and each option is separated by a "/".

*OPC <NR1>
*OPC?

Title:	Operation Complete
Description:	The *OPC command causes the device to set the OPC bit of the Standard Event Status Register on the next transition of the No Operation Pending flag from false to true. The *OPC? command returns 1 in the response whenever the No Operation Pending Flag is true.
Parameters:	N/A
Query Output:	<NR1>

*RST

Title: Reset

Description: This command restores most application and system settings to their factory default value. System settings affected by this command are Ethernet configuration. Note that the unit will power-cycle after this command is executed. After executing this command communication will be lost. Wait a minimum of 30 seconds before re-establishing communication.

*SRE \<NR1\>
*SRE?

Title: Service Request Enable

Description: Service Request Enable. The command sets the Service Request Enable Register bits. A zero value in the command resets the register. The query returns the value of the Service Request Enable Register in <NR1> format. Bit 6 is always zero.

Parameters: <integer>

Query Output: <NR1> Returns the value of the Service Request Enable Register

Range: 0 to 255

*STB?

Title: Status Byte Query

Description: This command queries the Status Byte Register. Refer to IEEE 488.2 for more information on the contents of this register.

Query Output: <NR1>

*WAI

Title: Wait-to-Continue Command

Description: This command causes the device to execute no further commands or queries until the No Operation Pending flag is TRUE.

7-7   System Commands

System commands control instrument functions and some general purpose functions.These commands affect instrument functionality that does not directly relate to data collection, display or transfer.

:SYSTem:ERRor[:NEXT]?

Title: System Error Queue

Description: If an error occurs, the error number and message are placed in the error queue, which can be read by this query command. Errors are cleared by reading them.

- Error code 0, is "No error".
- Error codes from –100 to –199 belongs to the Command error category and sets bit 5 of the standard ESR register.
- Error codes from –200 to –299 belongs to the Command error category and sets bit 4 of the standard ESR register.
- Error codes from –400 to –499 belongs to the Query error category and sets bit 2 of the standard ESR register.
- Error codes from –300 to –399 and 1 to 32767 belongs to the Device-specific error and sets bit 3 of the standard ESR register.

Negative error numbers (command error, execution error, device-dependent error, query error) are standard SCPI errors.

Positive error numbers are device specific errors, not standard SCPI errors.

The error queue is also cleared by *CLS, *RST, and when power is turned on. If more errors have occurred than can fit in the buffer, the last error stored in the queue (the most recent error) is replaced with –350, Queue overflow. No additional errors are stored until removing errors from the queue. If no errors have occurred when reading the error queue, the instrument responds with 0, No error.

:SYSTem:PRESet

Title: Preset

Description: This command presets parameters in the current application to their factory default values.

7-8   MA24507A Power Master Commands

General purpose commands for the MA24507A Power Master are used to set/read the general settings of the power analyzer. These commands are not mode or trigger dependent. The following considerations must also be observed:

- Command arguments presented in this document are enclosed in angle brackets: <argument>. The angle brackets are not included as part of the actual argument.

- Only SCPI commands that contain a question mark (?) called queries will return a value. No response should be expected for non-query commands.

`:ABORt`

Title:	Abort
Description:	Resets the trigger system. This has the effect of aborting the sweep or any measurement that is currently in progress. Additionally, any pending operation flags that were set by initiation of the trigger system will be set to false. If :INITiate:CONTinuous is OFF (i.e. the instrument is in single sweep mode), send the command :INITiate[:IMMediate] to trigger the next sweep. If :INITiate:CONTinuous is ON (i.e. the instrument is in continuous sweep mode) a new sweep will start immediately.

`:CALCulate:CWMax:COUNt <integer>`
`:CALCulate:CWMax:COUNt?`

Title:	Peak Count.
Description:	The desired number of measured signals to be reported by :FETC:CWMax? query.
Parameters:	<integer>
Query Output:	<integer>
Default Value:	1
Range:	1 to 6

`:CALCulate:CWMax:THReshold <numeric_value>{DBM}`
`:CALCulate:CWMax:THReshold?`

Title:	CW Max Threshold Level
Description:	Sets the threshold level which measured power must exceed to be reported by :FETC:CWMax? query.
Parameters:	<numeric_value> {DBM}
Query Output:	<NR2> Returns value in dBm
Default Value:	0 dBm
Default unit:	dBm
Range:	−150 dBm to 30 dBm

:CALCulate:CWMax:THReshold:STATe <0|1|ON|OFF>
:CALCulate:CWMax:THReshold:STATe?

Title: CW Max Threshold State

Description: Turn ON|OFF the threshold that the power must exceed to be reported by a
:FETch:CWMax? query.

Parameters: <0|1|ON|OFF>

Query Output: 0|1

Default Value: OFF

:FETCh:CWMax?

Title: Fetch CW Max Power

Description: Returns the most recent CW max power measurement result. If the instrument is not
sweeping and the current data is not valid, it will return error –230. This could occur if
there was a *RST immediately before the :FETChCWMax? or if a measurement
parameter was changed without an :INITiate, and the query will return the string "nan".

Parameters: N/A

Query Output: <NR2> returns a comma-delimited list of CW Max power measurement result pairs as
<frequency in Hz, power in dBm>

Default Value: 0

:FETCh:POWer?

Title: Fetch Channel Power

Description: Returns the most recent integrated power measurement result. If the instrument is
measuring, it will not return until the measurement is complete. If the instrument is not
measuring and the current data is not valid it will return error –230. This could occur if
there was a *RST immediately before the :FETCh? or if a measurement parameter was
changed without an :INITiate. If the measurement is not enabled with
[:SENSe]:CHPower:STATe then, the instrument will indicate error –400 and return the
string "nan"

Parameters: N/A

Query Output: <NR2> Returns the most recent integrated power measurement result in dBm.

`:INITiate:CONTinuous <0|1|ON|OFF>`
`:INITiate:CONTinuous?`

Title: Sweep Type

Description: Specifies whether the sweep/measurement is triggered continuously. If the value is set to ON or 1, another sweep/measurement is triggered as soon as the current one completes. If continuous is set to OFF or 0, the instrument remains initiated until the current sweep/measurement completes, then enters the "idle" state and waits for the :INITiate[:IMMediate] command or for :INITiate:CONTinuous ON. If :INITiate:CONTinuous is changed to ON before the current sweep/measurement completes, a new sweep/measurement will be continuously triggered as soon as the current sweep/measurement completes. If :INITiate[:IMMediate] is received before the current sweep/measurement completes, it will be ignored. Clients must either wait for the current sweep/measurement to complete before triggering a 'single sweep', or :ABORt the sweep/measurement after setting :INITiate:CONTinuous to OFF (which will cause the instrument to immediately enter the idle state where it can accept new triggers).

The default value is ON. That is, sending :INIT:CONT is equivalent to sending :INIT:CONT ON. The query version of the command returns a 1 if the instrument is continuously sweeping/measuring and returns a 0 if the instrument is in single sweep/measurement mode.

Parameters: <0|1|ON|OFF>

Query Output: 0|1

Default Value: ON

`:INITiate[:IMMediate]`

Title: Initiate measurement

Description: Triggers a measurement

:STATus:OPERation[:EVENt]?

Title: Get Operation Status

Description: This command requests information about the current status of the instrument. Each bit of the return value represents some operation. Only a subset of the bits are implemented for each application. The number returned is the decimal representation of the bit-wise OR of the enabled bits:

Bit	Decimal	Value Description
0	1	Not implemented
1	2	Not implemented
2	4	Not implemented
3	8	Not implemented
4	16	Not implemented
5	32	Not implemented
6	64	Not implemented
7	128	Not implemented
8	256	Sweep Complete

The Sweep Complete bit is set to 0 when the command :INITiate[:IMMediate] is sent to trigger a sweep. It will have a value of 1 when the sweep has completed.

Query Output: <NR1> Returns value 0 to 256

`[:SENSe]:AVERage:COUNt <numeric_value>`
`[:SENSe]:AVERage:COUNt?`

Title: Sense Average Count

Description: Sets the effective number of averages.

Parameters: <numeric_value>

Query Output: <NR2>

Default Value: 10

Range: 2 to 1000

`[:SENSe]:AVERage:STATe <0|1|ON|OFF>`
`[:SENSe]:AVERage:STATe?`

Title: Sense Average State

Description: Specifies whether successive power readings are averaged or not. Turning average state to ON will cause the measured power value to be the average of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. This setting only applies when the [:SENSe]:CHPower:STATe is also ON.

Parameters: <0|1|ON|OFF>

Query Output: 0|1

Default Value: OFF

`[:SENSe]:CHPower:STATe <0|1|ON|OFF>`
`[:SENSe]:CHPower:STATe?`

Title: Channel Power State

Description: Sets the state of the channel power measurement, ON or OFF.

Parameters: <0|1|ON|OFF>

Query Output: 0|1

Default Value: OFF

`[:SENSe]:FREQuency:CENTer <numeric_value>{HZ|KHZ|MHZ|GHZ}`
`[:SENSe]:FREQuency:CENTer?`

Title: Center Frequency

Description: Sets the center frequency. Note that changing the value of the center frequency will change the value of the coupled parameters Start Frequency and Stop Frequency. It may also change the value of the span.

Parameters: <numeric_value> HZ|KHZ|MHZ|GHZ

Query Output: <NR2> Returns frequency value in Hz

Default Value: 35000004500

Default Unit: Hz

Range: 9500 Hz to 69999999500 Hz

`[:SENSe]:FREQuency:CHWidth <numeric_value>{HZ|KHZ|MHZ|GHZ}`
`[:SENSe]:FREQuency:CHWidth?`

Title: Channel Width

Description: Sets the channel width for power measurements. The measured channel is centered around the [:SENSe]:FREQuency:CENTer value. The center frequency plus half the channel width may not exceed the maximum measuring frequency of the instrument.

Parameters: <numeric_value> HZ|KHZ|MHZ|GHZ

Query Output: <NR2> Returns frequency value in Hz

Default Value: 69999991000

Default Unit: Hz

Range: 1000 Hz to 69999991000 Hz

`[:SENSe]:POWer:RELative <0|1|ON|OFF>`
`[:SENSe]:POWer:RELative?`

Title: Relative Power Mode

Description: When the user enables Relative Mode the software begins to give power readings relative to the most recent power read before the command was sent. When Relative Power Mode is ON, all results returned by the :FETCh:POWer? and :FETCh:CWMax? queries are in units of dB as opposed to dBm.

Parameters: <0|1|ON|OFF>

Query Output: 0|1

Default Value: OFF

`[:SENSe]:POWer:RF:GAIN:STATe <0|1|ON|OFF>`
`[:SENSe]:POWer:RF:GAIN:STATe?`

Title: Preamp

Description: Sets the state of the internal amplifier for improved accuracy when measuring low-power signals.

Parameters: <0|1|ON|OFF>

Query Output: 0|1

Default Value: OFF

`[:SENSe]:RESolution HIGH|MEDium|LOW`
`[:SENSe]:RESolution?`

Title: Power Resolution Mode

Description: Specifies the resolution of the power measurement in CW max mode only. The resolution determines the relative precision of the frequency reported when getting the CW max power results with the :FETCh:CWMax? query. There is a trade-off between measurement speed and resolution so HIGH resolution will produce fewer measurements per unit time than LOW resolution.

Parameters: HIGH|MEDium|LOW

Query Output: LOW, MED, or HIGH

Default Value: LOW

Alphabetical Index of Programming Commands

Anritsu

10585-00029

A

Anritsu utilizes recycled paper and environmentally conscious inks and toner.