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Brochure / Technical Data Sheet

Anritsu

USB Power Sensor MA24106A

True-RMS, 50 MHz to 6 GHz

- Economical Alternative to Traditional Benchtop Meters
- True RMS Measurements Over a 63 dB Dynamic Range
- High Damage Power Levels and ESD Protection
- No Need for a Reference Calibrator
- Light Weight and Easy to Use

Handy, Highly Accurate and Reliable USB Sensor
for your RF Power Measurement Needs

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Accurate Enough for Lab, Fast Enough for Manufacturing and Rugged Enough for Field Applications

Features

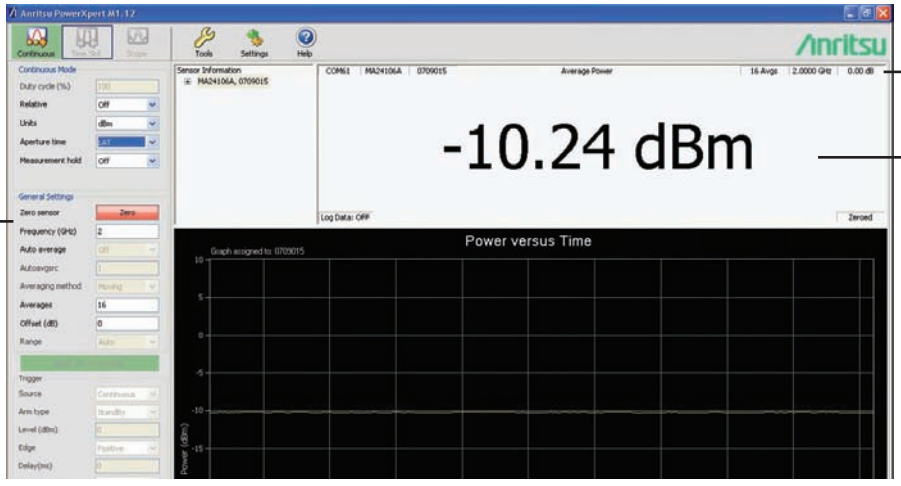
- True RMS detection over a 63 dB dynamic range enables accurate CW and modulated power measurements
- Ready for use in a wide variety of applications, including installation and maintenance of base stations, testing of 3G and 4G products, cell phones and general purpose RF devices
- High damage power levels and ESD protection provides ruggedness and reliability
- Low current consumption (100 mA) preserves laptop battery life
- Eliminating the need for a reference calibrator reduces test time and handling in production
- Light weight, economical and easy to use with a desktop or laptop PC
- One year calibration cycle and worldwide service centers ensure reduced downtime
- Compatible with PowerXpert™, Spectrum Master™, VNA Master™, BTS Master™, Site Master (S3xxE), Cell Master™ (MT8212E), and Economy Spectrum Analyzer (MS271xB)

N connector designed for use with a torque wrench ensures repeatable connections

Sturdy aluminum body with ergonomic design for better grip and feel

Two-color LED reports functional status of the sensor

USB Mini-B Port for PC connectivity



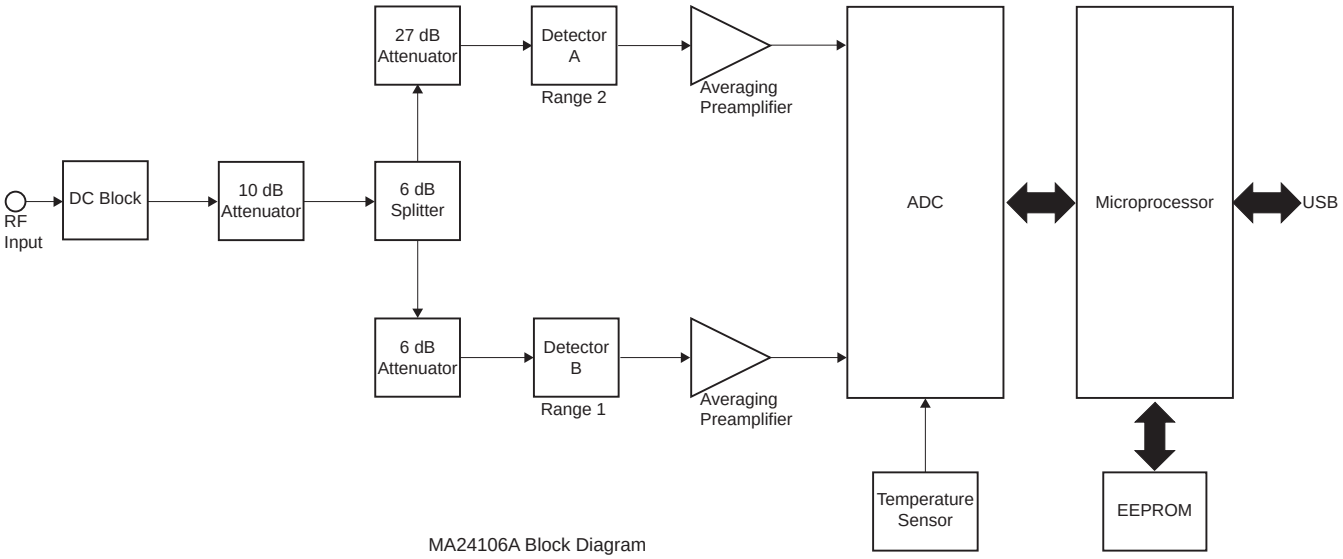
Power Meter settings available on screen

Measurement setup status available on screen

Big display for easy readout

MA24106A Architecture

The MA24106A power sensor is a highly accurate instrument that communicates with a PC using the Universal Serial Bus interface (USB). Its measurement capability mimics a traditional thermal (thermo-electric) power sensor, but has a wider dynamic range. Therefore, the MA24106A is ideal for measuring average power of CW, multi-tone, and modulated RF waveforms such as 3G, 4G, and OFDM. It measures true RMS power regardless of the type or bandwidth of the input signal.



MA24106A Block Diagram

The sensor employs a “dual-path” architecture to achieve 63 dB of dynamic range. Highly accurate modulation measurements are facilitated by keeping the diode detectors in the “square law region” and by choosing the output of the appropriate detector path. A built-in attenuator provides excellent SWR performance thus minimizing mismatch error. The presence of a micro-controller along with signal conditioning circuitry, ADC, and power supply in the sensor makes it a complete miniature power meter. The PowerXpert application for personal computers running Microsoft® Windows® can be used to control and operate the sensor providing the user with a familiar power meter interface with advanced features.

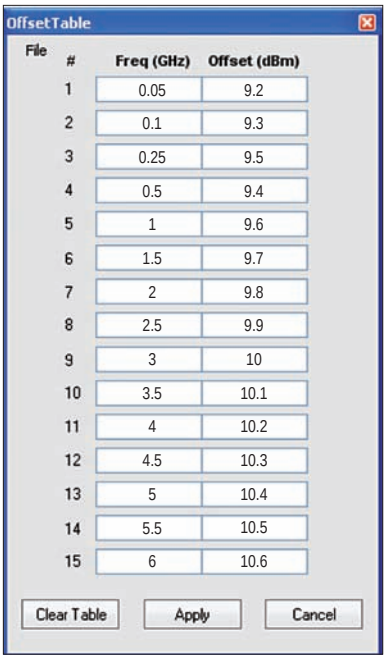
Rugged for Field Use

The MA24106A power sensor provides lab performance accuracy in a rugged and portable field solution. Measurement accuracy over a wide temperature range is maintained by internally stored calibration factors with temperature compensation, thus making it perfect for base station installation and maintenance applications. Field and service technicians will appreciate the small size and light weight as they can carry it in their shirt pocket or laptop case. A very easy to use PC application with a large display makes operation straightforward for users with limited training. The high damage level (+33 dBm) and ESD protection (3.3 kV) provides ruggedness to this high performance sensor. Since the MA24106A is a low power device, laptop battery life is preserved.

Fast and Flexible for Production

The MA24106A facilitates lab quality measurements on the production floor for a fraction of the cost of traditional power meters. Valuable rack space is saved since the sensor is connected directly to a PC, eliminating the need for a bench top power meter. Sensor speed is optimized for best accuracy and noise performance making it suitable for a wide variety of ATE applications. Multiple sensors can be connected and remotely controlled via a single PC allowing flexibility to match specific measurement needs. The reference calibrator typically needed by power meters has been eliminated, minimizing test station complexity, sensor handling and reducing test times.

The offset table provides the ability to correct for the frequency response of RF devices present between the sensor and the DUT, thus providing better accuracy than just using a fixed offset. A simple interface allows entry of different offset values versus frequency. An unlimited number of offset tables can be stored on a PC's hard disk and easily recalled. The offset table employs linear interpolation to estimate offset correction for frequencies between user specified entries.



Compensate for frequency response of RF devices with offset table. Values are easily saved to and recalled from the PC's hard disk.

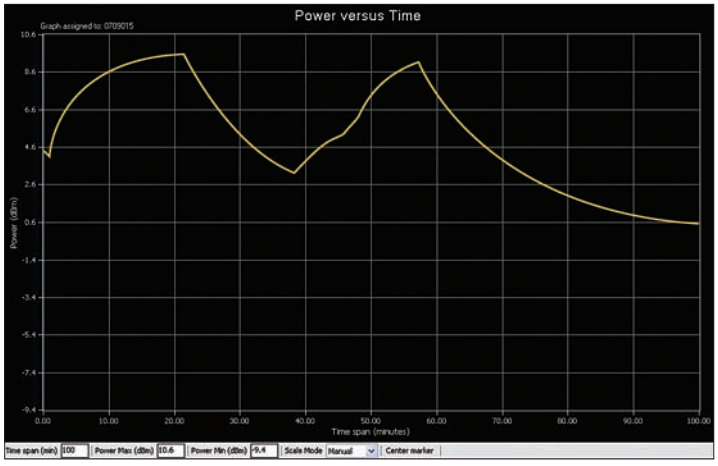
High Accuracy for R&D Use

The MA24106A is an ideal general purpose R&D tool due to its low cost, ability to measure a variety of RF waveforms, wide dynamic range, and power accuracy. Its compact size saves space by replacing traditional bench top instruments. True RMS power measurements of modulated signals are made effortlessly with no limits on modulation bandwidths. Accuracy is assured because the calibration data is stored directly in the sensor and all necessary corrections (frequency and temperature) are done internally. The standards used to calibrate this sensor are directly traceable to NIST and periodic calibrations are supported by Anritsu's service centers worldwide.

The PowerXpert software provides an intuitive interface to control the sensor. It has advanced features such as average power versus time display and data logging, plus a customizable offset table enabling flexible data capture and accurate measurements versus frequency.

The power graph plots power with respect to time. It is useful for drift testing, circuit tuning, or circuit monitoring as external stimuli are changed. The graph is continuously updated in real time at ten measurements per second.

Data logging is also available for recording power versus time to a hard disc or other storage media. This is useful for long term drift studies, environmental testing, and trend analysis. A user defined logging interval allows acquisition speed to match test requirements. Data are stored as a comma separated value (.csv) that can be opened in Microsoft® Excel® facilitating custom analysis.



Power versus Time graph shows the effect of turning on and off the cooling fan of a 2 GHz power amplifier

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MA24106A CalXpert™ Software Application for Calibrating MA24016A Power Sensors

MA24106A CalXpert™ is a calibration wizard that guides you through the range connection test and performs the necessary operations to upload calibration data into the power sensor. It provides a convenient way to:

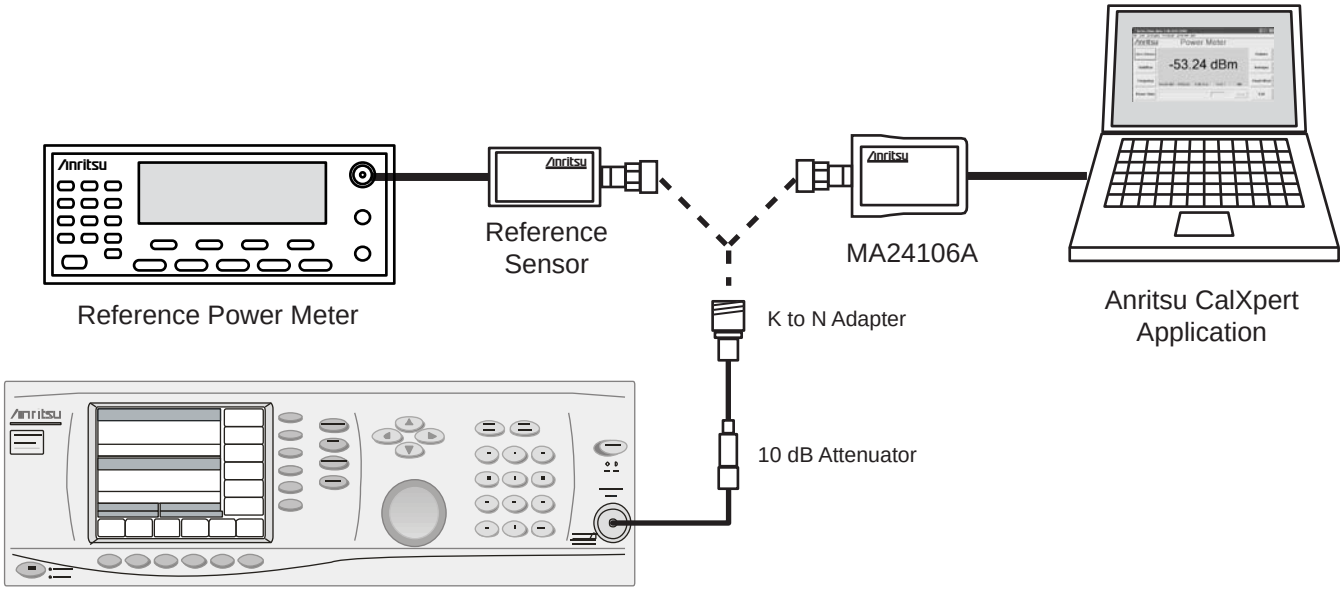
- Perform range connection characterization
- Upload the new range connection characterization data into the sensor
- Upload 50 MHz sensitivity calibration and calibration factor data into the sensor*
- Provide a report of new and old calibration data

As a precaution, MA24106A CalXpert™ will also retain a file of the old calibration data that the user can restore to the sensor using MA24106A CalXpert™ if required.

*MA24106A CalXpert does not control the full suite of equipment to obtain sensitivity calibration and calibration factor data – it is assumed that users have access to an appropriately equipped calibration lab to obtain this data. The PowerXpert software supplied with the sensor can be used with a PC to read the responses of the power sensor during the gathering of calibration factor and sensitivity data.

Equipment requirements for performing range connection characterization and to upload calibration data into the sensor.

- Computer equipped as follows:
    1. Intel® Pentium® III with 1 GB RAM or Intel® Pentium® IV with 512 MB RAM, or equivalent (Intel® Pentium® IV with 1 GB RAM recommended)
    2. Microsoft® Windows Vista® (32-bit only), Windows XP or Windows 2000
    3. Microsoft® .NET 3.5
    4. 100 MB hard-disk free space
    5. Display resolution 1024 × 768
    6. USB 2.0 full speed (compatible with USB 1.0 and 1.1) interface
    7. CD-ROM drive
- Synthesizer: 50 MHz to 6 GHz, +15 dBm minimum (Anritsu MG3690 Series)
- Reference Power Meter and Sensor: Absolute power accuracy better than 0.5 dB (Anritsu MA24106A or ML2437A, with MA2442D)
- 10 dB Fixed Attenuator: 1.25 SWR from 50 MHz to 6 GHz (Anritsu 41KA-10)
- K to N Adapter (Anritsu 34NFK50)



Typical Equipment Setup for Range Connection Characterization

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Specifications

Sensor	
Frequency range	50 MHz to 6 GHz
Dynamic range	–40 dBm to +23 dBm
Input return loss	> 26 dB (50 MHz to < 2 GHz) > 20 dB (2 GHz to 6 GHz)
Measurement ranges	Range 1, –40 dBm to –5 dBm Range 2, –5 dBm to +23 dBm
Signal channel bandwidth	100 Hz, typical
Measurement Uncertainty	
Linearity	± 0.13 dB (power level < +18 dBm) ± 0.18 dB (power level ≥ +18 dBm)
Calibration factor[1]	± 0.06 dB
Noise[2]	< 2.5 nW (–40 dBm to –5 dBm) < 0.6 µW (–5 dBm to +23 dBm)
Zero set	< 10 nW (–40 dBm to –5 dBm) < 1.7 µW (–5 dBm to +23 dBm)
Zero drift[3]	< 3.0 nW (–40 dBm to –5 dBm) < 0.5 µW (–5 dBm to +23 dBm)
Temperature compensation[4] (0º C to 50º C)	± 0.06 dB
Effect of digital modulation[4]	± 0.02 dB (power level < +18 dBm) ± 0.10 dB (power level ≥ +18 dBm)
System	
Measurand	True-RMS/Average power
Measurement resolution	0.01 dB
Offset range	± 100 dB
Averaging range	1 to 256
Measurement speed[5]	10 measurement per second, typical
Range	Auto ranging between Range 1 and Range 2
Interface	USB 2.0
Host operating system (PowerXpert application compatibility)	Microsoft® Windows 7, Windows® Vista, Windows XP, and Windows 2000
General	
Current (via host USB)[6]	100 mA typical at 5 V
Maximum DC voltage at RF port	± 25 V
Maximum CW power	+ 33 dBm
Size (W x H x D)[7]	56 mm x 30 mm x 85 mm typical (2.2 in. x 1.18 in. x 3.35 in.)
Weight	180 grams typical (6.4 oz.)
Environmental[8]	
Operating Temperature Range	0 ºC to +55 ºC
Storage Temperature Range	–51 ºC to +71 ºC
Humidity	45% relative humidity at 55 ºC (non-condensing) 75% relative humidity at 40 ºC (non-condensing) 95% relative humidity at 30 ºC (non-condensing)
Shock	30 g half-sine, 11 ms duration
Vibration	Sinusoidal: 5-55 Hz, 3 g max. Random: 10-500 Hz, Power Spectral Density 0.03 g^2/Hz
EMC	Meets EN 61326, EN 55011
Safety	Meets EN 61010-1

Notes:

All specs are applicable after twenty minutes warm-up at room temperature unless specified otherwise.

[1] Expanded uncertainty with K=2 for absolute power measurements on CW signal at 0 dBm calibration level from 50 MHz to 6 GHz.

[2] Expanded uncertainty with K=2 after zero operation when measured with 128 averages for 5 minutes. In high aperture time mode, noise is 1.3 nW and 0.3 µW in range 1 and range 2 respectively.

[3] After one hour warm-up and zero operation. Measured with 128 averages for one hour keeping the temperature within ± 1 ºC.

[4] Measurement error with reference to a CW signal of equal power and frequency at 25 ºC.

[5] One measurement per second, typical in high aperture time mode.

[6] 150 mA max.

[7] Not including N connector.

[8] Tests were performed per MIL-PRF-28800F (Class 2)

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Ordering Information

MA24106A USB Power Sensor

Included Accessories

2000-1566-R	1.8 meters USB A to Mini-B cable
2300-526	Product CD - Anritsu PowerXpert and USB power sensors
10585-00021	Quick Start Guide

Available Options

MA24106A-097	Option 97, Accredited Calibration to ISO17025 and ANSI/NCSL Z540. Test report and uncertainty data included.
MA24106A-098	Option 98, Standard calibration to ISO17025 and ANSI/NCSL Z540.
MA24106A-099	Option 99, Premium calibration to ISO17025 and ANSI/NCSL Z540. Test report and uncertainty data included.

Optional Accessories

Cables	
2000-1593-R	3 meters USB A to Mini-B cable
2000-1594-R	5 meters USB A to Mini-B cable
Calibrated Torque Wrenches	
01-200	Calibrated torque wrench for N connector
01-204	Calibrated torque wrench for K and V connectors
Power Attenuators	
3-1010-123	N(m) to N(f), DC to 8.5 GHz, 30 dB, 50 W, 50 Ω
3-1010-124	N(m) to N(f), DC to 8.5 GHz, 40 dB, 100 W, 50 Ω
3-1010-122	N(m) to N(f), DC to 12.4 GHz, 20 dB, 5 W, 50 Ω
42N50-20	N(m) to N(f), DC to 18 GHz, 20 dB, 5 W, 50 Ω
42N50-30	N(m) to N (f), DC to 18 GHz, 30 dB, 50 W, 50 Ω
Precision Coaxial Adapters	
510-90	N(m) to 7/16 DIN(f), DC to 3.3 GHz
510-91	N(f) to 7/16 DIN(f), DC to 3.3 GHz
510-92	N(m) to 7/16 DIN(m), DC to 3.3 GHz
510-93	N(f) to 7/16 DIN(m), DC to 3.3 GHz
33NFNF50B	N(f) to N(f), DC to 18 GHz
33NNF50B	N(m) to N(f), DC to 18 GHz
33NN50B	N(m) to N(m), DC to 18 GHz
34AN50	GPC-7 to N(m), DC to 18 GHz
34ANF50	GPC-7 to N(f), DC to 18 GHz
34NFK50	N(f) to K(m), DC to 18 GHz
34NFKF50	N(f) to K(f), DC to 18 GHz
34NK50	N(m) to K(m), DC to 18 GHz
34NKF50	N(m) to K(f), DC to 18 GHz
Sensor Calibration Utility	
2300-528	MA24106A CalXpert™

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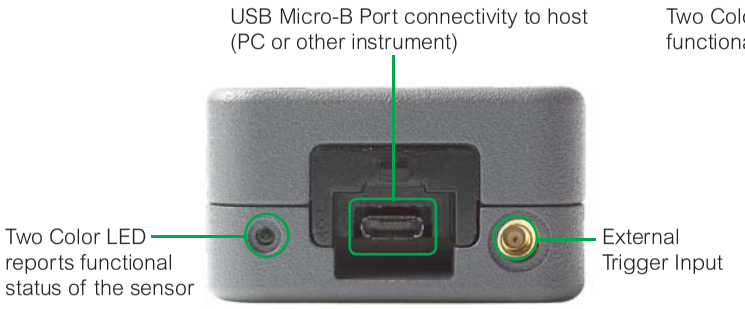
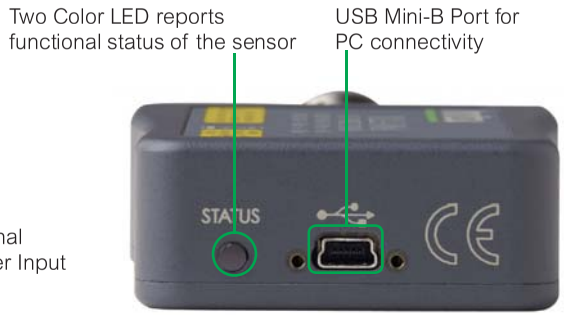
MA241xxA Series USB Power Sensors

Highlights

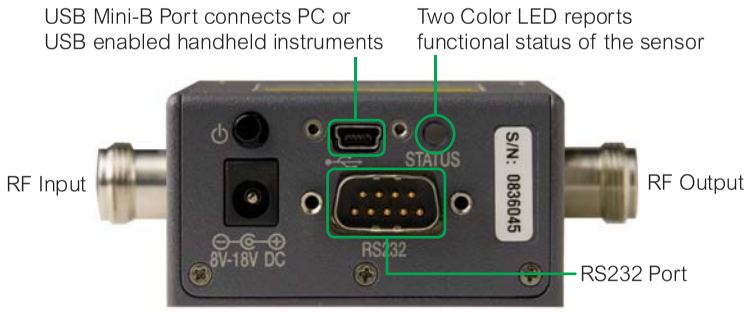
- Power Measurements with 10 MHz to 26 GHz Frequency Measurement Range
- True RMS Measurements over 63 dB Dynamic Range
- NIST Traceable Calibration
- Built-in Internal and External Trigger in Microwave USB Sensors
- Easy to Use with PC or Select Anritsu Handhelds
- No Need for a Reference Calibrator
- Economical Alternative to Traditional Benchtop Meters
- Light Weight and Easy to Use



Microwave USB Power Sensors



USB Power Sensors



Inline High Power Sensors

PowerXpert™ Data Analysis and Control Software

Power sensors can be used with a PC running Microsoft Windows® via USB. A front panel display makes the PC appear like a traditional power meter. The PowerXpert application has abundant features, such as data logging, power versus time graph, big numerical display, and many more features that enable quick and accurate measurements.

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MA241xxA Series USB Power Sensors

Ordering Information

Microwave USB Power Sensors

Model	Description	Power Range
MA24108A	True-RMS, 10 MHz to 8 GHz USB Power Sensor	-40 dBm to +20 dBm
MA24118A	True-RMS, 10 MHz to 18 GHz USB Power Sensor	-40 dBm to +20 dBm
MA24126A	True-RMS, 10 MHz to 26 GHz USB Power Sensor	-40 dBm to +20 dBm

Includes:

- *Product CD - Anritsu PowerXpert and USB Power Sensors*
- *Quick Start Guide*
- *1.5 m BNC (m) to MCX (m) Cable*
- *1.8 m USB A to Micro-B Cable with Latch*

USB Power Sensor

Model	Description	Power Range
MA24106A	True-RMS, 50 MHz to 6 GHz USB Power Sensor	-40 dBm to +23 dBm

Includes:

- *Product CD - Anritsu PowerXpert and USB Power Sensors*
- *Quick Start Guide*
- *1.8 m USB A to Mini-B Cable with Screws*

Inline High Power Sensor

Model	Description	Power Range
MA24104A	True-RMS, 600 MHz to 4 GHz Inline High Power Sensor	2 mW to 150 W

Includes:

- *Product CD - Anritsu PowerXpert and USB Power Sensors*
- *Quick Start Guide*
- *1.8 m USB 2.0 A to Mini-B Cable with Screws*
- *1.8 m RS-232 Cable*
- *External Power Supply*
- *AA Batteries (Qty 3)*

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MA24106A
USB Power Sensor
Quick Start Guide

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Introduction

This guide provides installation instructions for the MA24106A USB power sensor. It contains the following:

- Hardware and Software Requirements for the installation and operation of the sensor
- Driver Installation procedure for properly installing the driver for the sensor

Hardware and Software Requirements

Please make sure that the following minimum requirements are met to control the power sensor via a personal computer:

- Intel® Pentium® III or equivalent processor
- Microsoft® Windows Vista® (32-bit only), Windows XP or Windows 2000
- 512 MB of RAM
- 100 MB of available hard-disk space
- 1024 × 768 display resolution
- PC or laptop with a USB port and CD-ROM drive

Driver Installation

The driver must be installed before the MA24106A power sensor can be used. Follow the steps below as a guide for proper installation:

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1. Insert the installation CD in the drive of your computer. If the installation menu does not start automatically, open the file named **Startup.htm** located on the CD.

Figure 1. Anritsu Power Meter Installation Menu

Note: If required, please install the .Net Framework, version 2.0.

2. Click **Install Power Meter Application** and select **Run** to start the installation.

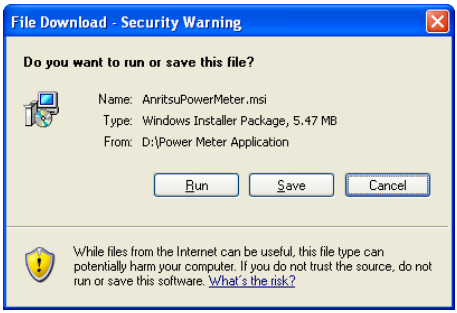

Figure 2. File Download - Security Warning

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3. Click **Next** in the following screen to begin the installation process.

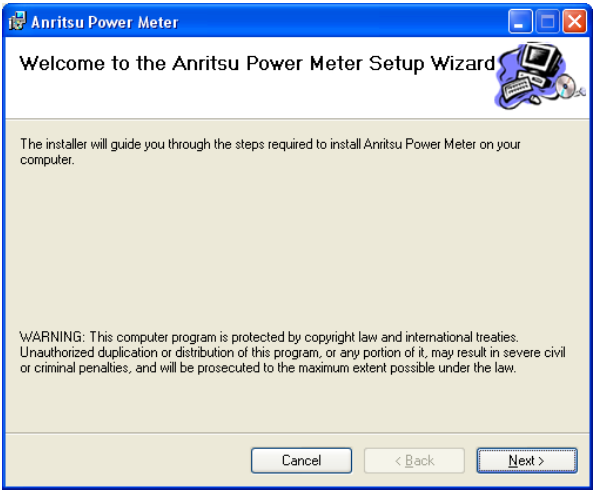

Figure 3. Anritsu Power Meter Installation

4. Browse for the installation folder and select the desired permissions, and then click **Next**.

   The default installation directory is:

   C:\Program Files\Anritsu\AnritsuPowerMeter

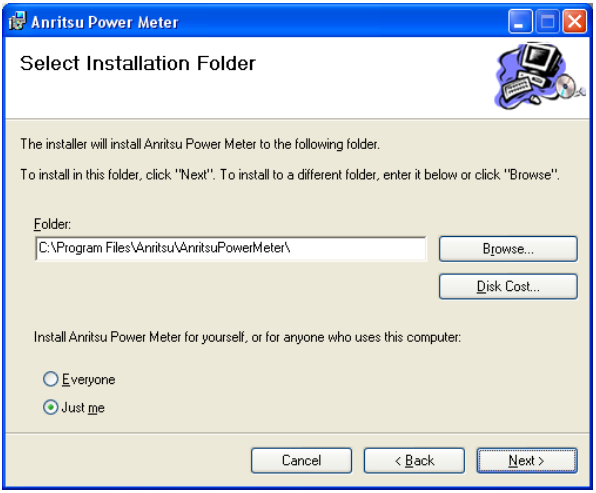

Figure 4. Anritsu Power Meter Installation

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5. Select **I Agree** to the license agreement, and then click **Next**.

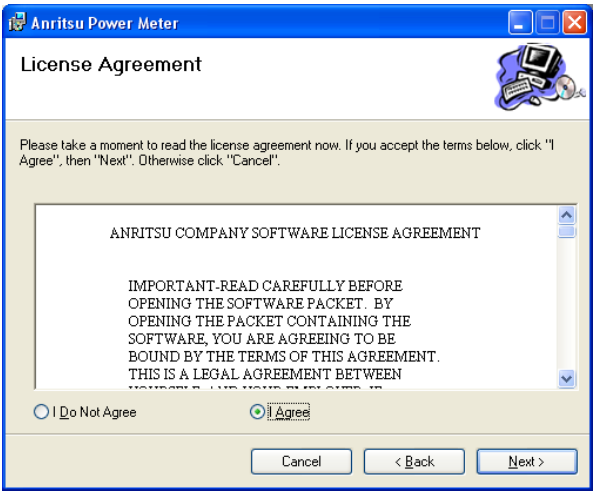

Figure 5. License Agreement

6. Select **Next** to continue with the software installation.

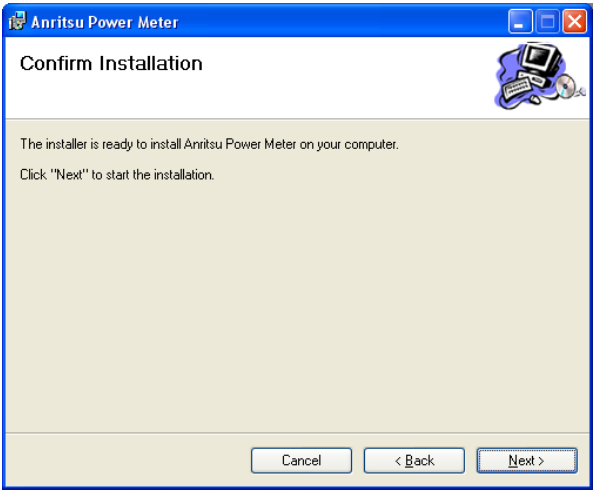

Figure 6. Confirm Installation

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The software will then install to the selected location.

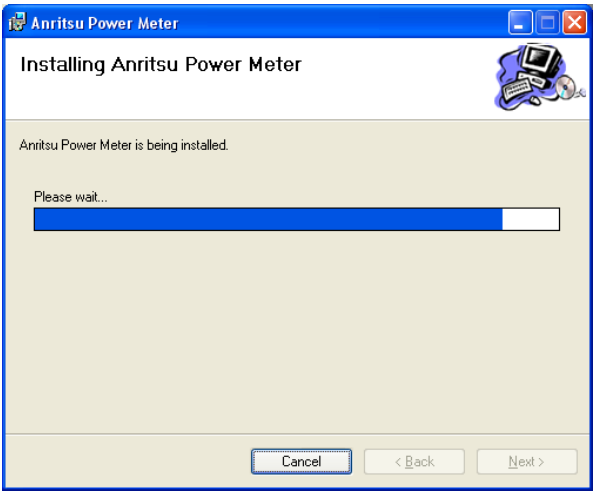

Figure 7. Installing the Anritsu Power Meter Application

7. When the installation completes, click **Close**.

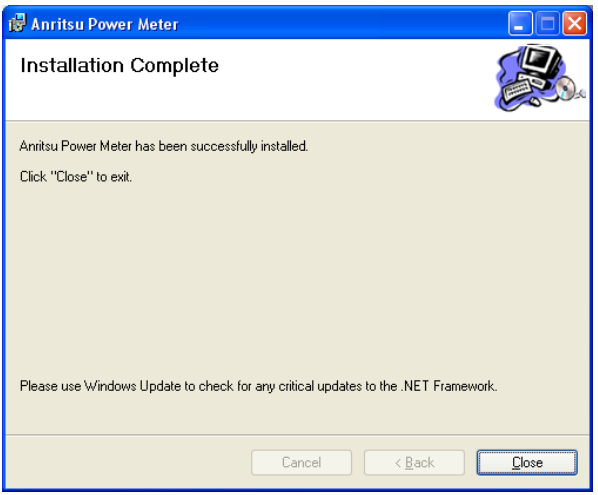

Figure 8. Application Installation Complete

8. Connect the MA24106A power sensor to the USB port of the PC with the supplied USB cable. The status LED will light green indicating that the sensor is turned ON.

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9. When the Found New Hardware Wizard installation screen appears, select **No, not this time** to search for software, and then click **Next**.

Figure 9. Found New Hardware Wizard

10. Select **Install from a list or specific location (Advanced)**, and then Click **Next**.

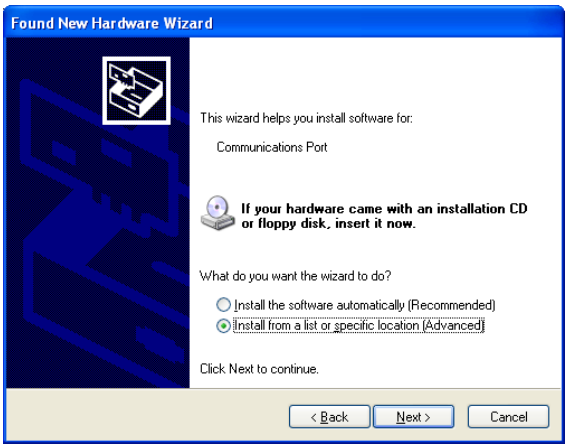

Figure 10. Found New Hardware Wizard

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11. Select **Don't search. I will choose the driver to install**, and then click **Next**.

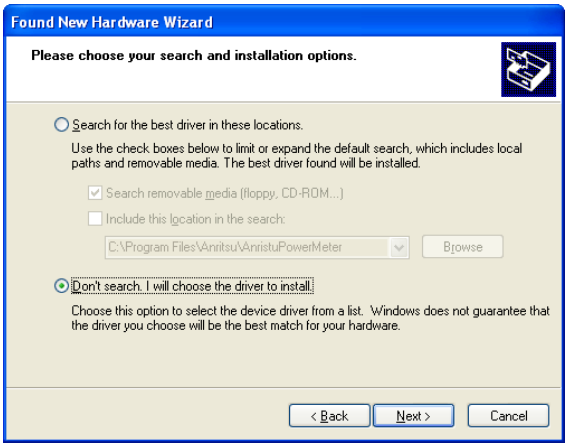

Figure 11. Found New Hardware Wizard

12. Select the hardware type **Computer**, and then click **Next**.

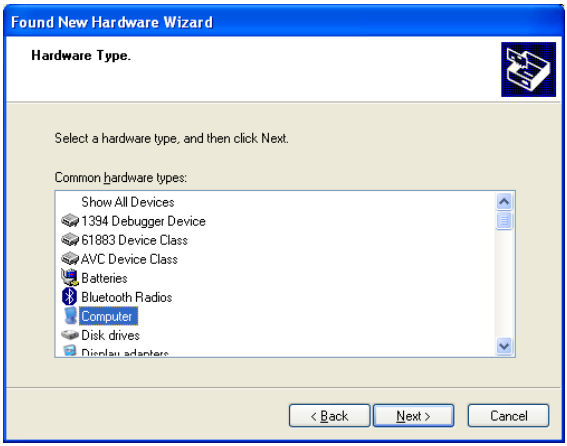

Figure 12. Found New Hardware Wizard

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13. Click **Have Disk...**, and then click **Next**.

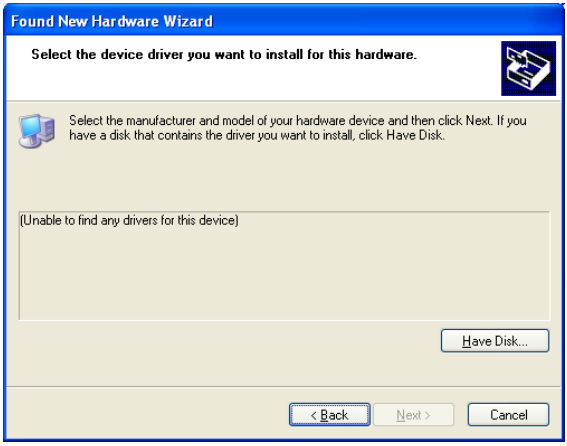

Figure 13. Found New Hardware Wizard

14. Browse to the location on your hard drive where you installed the program. If the default settings were chosen during the application installation, click **Browse...**, as shown below, and then select:

    C:\Program Files\Anritsu\AnritsuPowerMeter\AnritsuMA24106A.inf

15. Click **OK**.

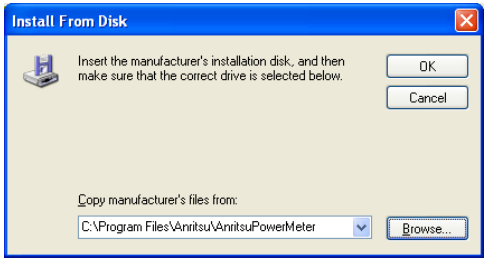

Figure 14. Install From Disk

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16. Select **Anritsu MA24106A** from the list, and then click **Next** as shown below.

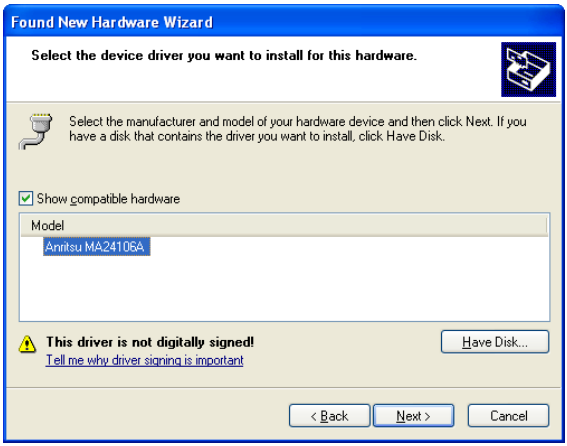

Figure 15. Found New Hardware Wizard

17. The Hardware Installation warning may appear as shown in Figure 16. Click **Continue Anyway**.

Figure 16. Hardware Installation

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18. Click **Finish** to close the wizard.

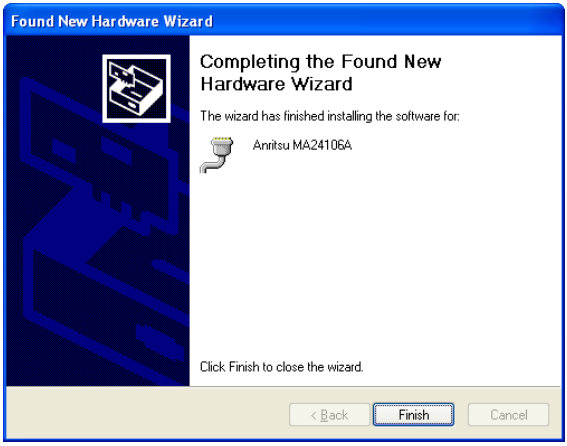

Figure 17. Found New Hardware Wizard

The MA24106A is now ready for use.

19. Launch the Anritsu Power Meter application from the new desktop icon or from the **Start | Programs** menu.

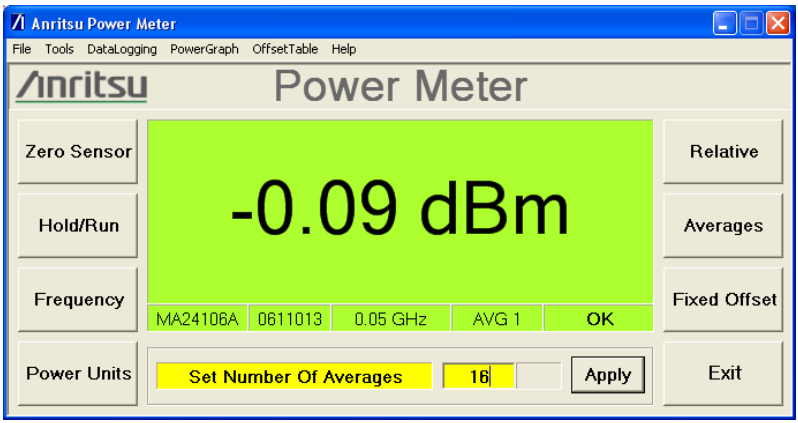

Figure 18. Anritsu Power Meter Application

20. Refer to the MA24106A User Guide or Online Help for information about using the Anritsu Power Meter application.