

Agilent U2000 Series USB Power Sensors

Technical Overview

Simple Setup, More Than Just a Sensor

- ✓ Power measurement without a power meter
- ✓ Frequency range: 9 kHz to 24 GHz
- ✓ Dynamic range: -60 dBm to +20 dBm
- ✓ Internal zeroing capability
- ✓ Simplified measurement setup with built-in triggering module



Design for Today's Demanding Applications

Agilent Technologies power meters have long been recognized as the industry standard for RF and microwave power measurements. Today, with the latest generation of USB power sensors, Agilent provides a complete solution for today's demanding applications.



Simple Set Up, More Than Just a Sensor

- ✓ Power measurements on PCs or other Agilent instruments without the need for a power meter
- ✓ Simplified measurement setup eliminates the need for an external power supply and triggering module
- ✓ Internal zeroing capability to eliminate external calibration
- ✓ High measurement speed of up to 250 readings/second
- ✓ USB plug-and-play capability that transforms your computer, Agilent signal source, spectrum analyzer or network analyzer into an accurate power meter measurement system
- ✓ Simultaneous operation of up to 10 channels in the same window
- ✓ Feature-rich software applications for simplified setup, monitoring and data collection.
- ✓ Frequency range of 9 kHz to 24 GHz (sensor-dependent)
- ✓ Wide power range of -60 dBm to $+44$ dBm (sensor-dependent)

Excellent performance without compromise

The Agilent U2000 Series USB power sensors allow you to display power measurements on a PC or other Agilent instruments without the need for a separate power meter. The compact U2000 Series provides the same functionality and performance as a conventional power meter and sensor. This is a cost-effective solution that leverages the latest diode sensor technologies, hence you will experience the same level of performance for your power measurements with at reduced costs.

With the combined functionality of power meter and power sensor in a U2000 Series power sensor, it returns the power measurement readings and display on your PC through a USB cable. The power measurement readings can be retrieved using standard SCPI commands or IVI-COM/IVI-C drivers. The SCPI-based command set provides a user-friendly programming environment that enables you to communicate with the power sensor in the same way as you can communicate with the power meter.

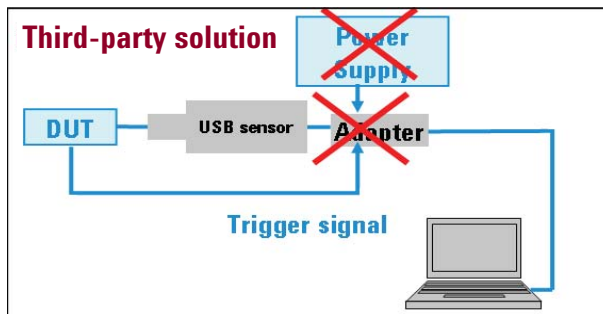
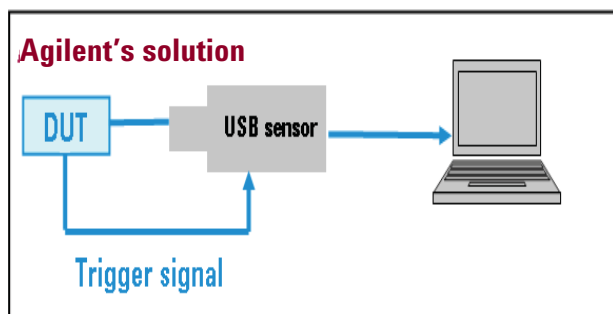
The U2000 Series is compliant with USBTMC-USB488. It provides the plug-and-play environment for USB-based instruments and enables the USB sensor to emulate the operation of the GPIB instruments.

Simplified measurement setup without the need for an external power supply and triggering module

The U2000 Series is a complete solution that simplifies your measurement setup and meets all your measurement requirements. No external power supply is required to power up the sensor as it utilizes the power from the USB port. The low current consumption (approximately 170 mA) enables a number of USB sensors to be connected to a PC without the need for an external USB hub to supply any additional power.

The U2000 Series consists of a built-in triggering circuit that enables measurement synchronization with the external instrument or event, for instance, to control the timing of capturing a pulse signal. With the plug-and-play capability of the U2000 Series, a quick connection can be established between the USB power sensor and the PC for your immediate measurements.

The feature-rich N1918A Power Panel which is part of the U2000 Series devices allows you to monitor the performance of your power sensor and perform data logging without going through the programming guide in order to develop your own application. The data logging function allows for logging data of up to 10,000 points.



External calibration-free measurements

The U2000 Series provides internal zeroing which eliminates the needs to disconnect or power off the device under test. It integrates a switching circuit into each USB sensor so that the users can perform the zeroing while the sensor is still connected to a device under test. The compact design of the U2000 Series also eliminates the sensor calibration that required an external reference source as well as the path loss calibration which was caused by the different combinations of power meters and sensors. Users can rely on the factory calibration to ensure measurement accuracy. The internal zeroing function and calibration-free design remove the steps to connect and disconnect the power sensor from a 50MHz reference calibration source. This reduces the testing times, measurement uncertainty, and the wear and tear of the connector. The USB power sensors can also be embedded into the test fixtures without switching the reference signals.

Greater accuracy and functionality via compatibility with other instruments

The Agilent signal source, network analyzer or spectrum analyzer will be compatible with the U2000 series. Users can extend the capability of these instruments with the U2000 series by transforming them into an accurate power meter measurement system. The power measurement can be displayed on the screen of these instruments, which allow users to switch between the power meter and the instrument window (with future firmware releases on these instruments).

For all the PNA, PNA-L or PNA-X series, the USB power sensor is now compatible with these instruments to perform Source Power Calibration (with PNA firmware revision of A.07.50.00 and above). The PNA firmware will control the sensor during calibration, thus achieving a higher degree of measurement accuracy with these instruments.

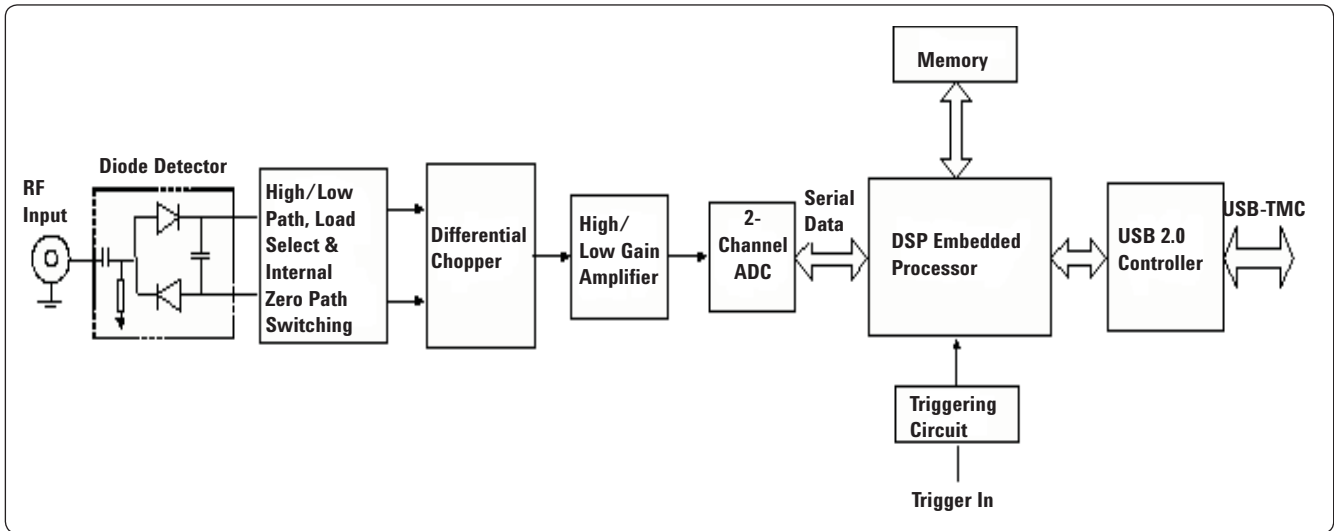


Figure 2. Transforms your signal analyzer into an accurate power meter

Low cost, high productivity, multi-channel power measurements

For applications that require multi-channel power measurements, such as satellite communication systems, the U2000 Series is the ideal cost-effective solution for your power meter measurements. The N1918A Power Analysis Manager — Power Panel is the basic software version that is bundled together with every U2000 Series USB Power Sensor. The Power Panel displays power measurements in various formats including simultaneous multi-list measurements of more than ten channels in one window. This will significantly improve your productivity as you can monitor multiple channels on one screen instead of monitoring multiple power meters simultaneously. The limit and alert setting enables remote monitoring, whereby you will be prompted when a measurement deviation occurs. The record and load functions will minimize the troubleshooting time.

N1918A Power Panel, the intuitive soft front panel

The U2000 Series is bundled with the Power Panel, which offers a standard GUI for basic power measurement. The Power Panel can display power measurements in both analog and numerical formats and a trend chart display that monitors up to 10,000 data points. The Power Panel also comes with mathematical functions for multiple channels such as delta, sum and ratio in multi-list measurements. The software contains an integrated Help File that guides you through the operation of each function.

The provided save and record functionality of the U2000 Series can be disabled using the password protection. This aims to prevent any unauthorized data storage and safeguard sensitive information and measurements. With this, the U2000 Series is suitable to be used in secured environments.

N1918A-100 Power Analyzer

The N1918A Power Analysis Manager offers an oderable option, the N1918A-100 Power Analyzer. This tool further enhances the capabilities of the U2000 Series. It contains the limit and alert functions for remote monitoring, extends the recording time to as long as seven days, and provides data logging and timestamp functions for deviation monitoring and analysis. Additionally, you can save the screen images or the measured raw data in a bitmap or an Excel-compatible format for further data analysis. The Power Panel provides the printing flexibility you need for your data acquisition or storing purposes. The Power Analysis Manager is compatible with N1911/12A P-Series power meters. It offers comprehensive pulse parameter characterization with up to 15-point pulse parameters with minimum, maximum and average values displayed.

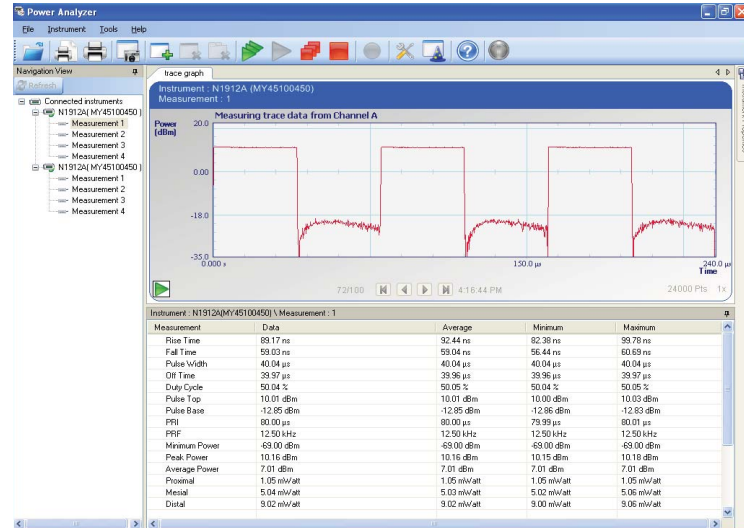


Figure 3. N1918A Option-100, Power Analyzer, works with the Agilent P-Series power meters to perform a complete pulse characterization (same functionality as that of a peak power analyzer).

Furthermore, the Power Analyzer supports PDF, CDF and CCDF statistical analysis, waveform mathematics and overlay. For more details about the N1918A Power Analysis Manager, please refer to the Agilent N1918A Power Analysis Manager Data Sheet, literature number 5989-6612EN.

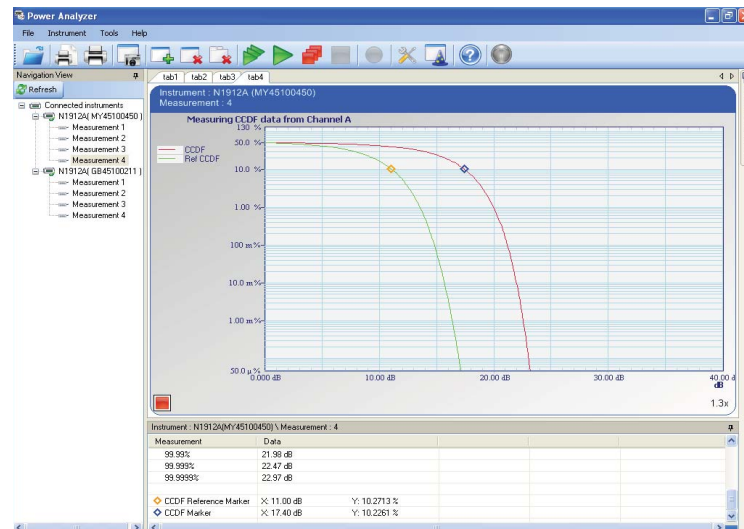


Figure 4. The Power Analyzer enables CCDF display in both graphical and tabular formats.

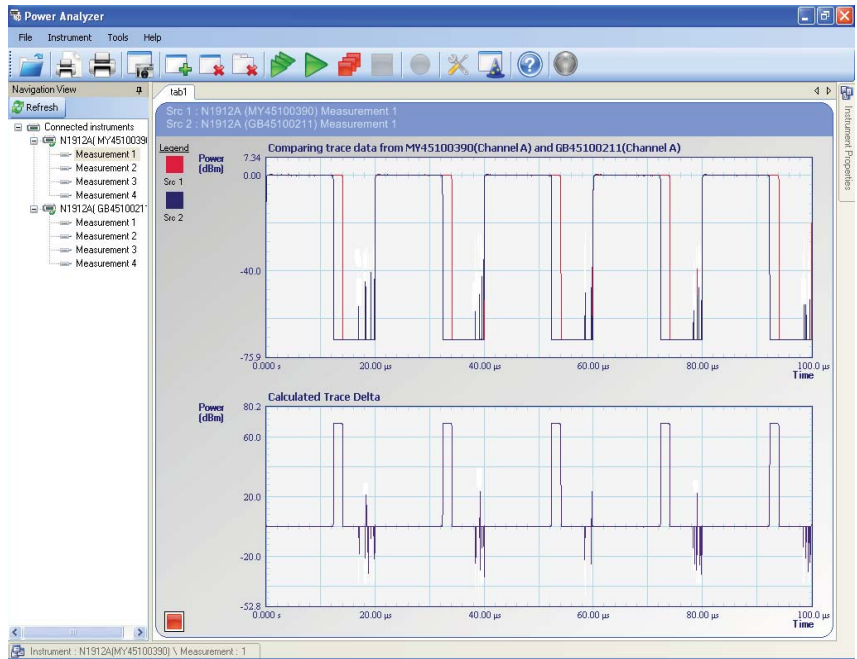


Figure 5. Waveform mathematical functions that include delta, sum and ratio for multiple channels of the power meters

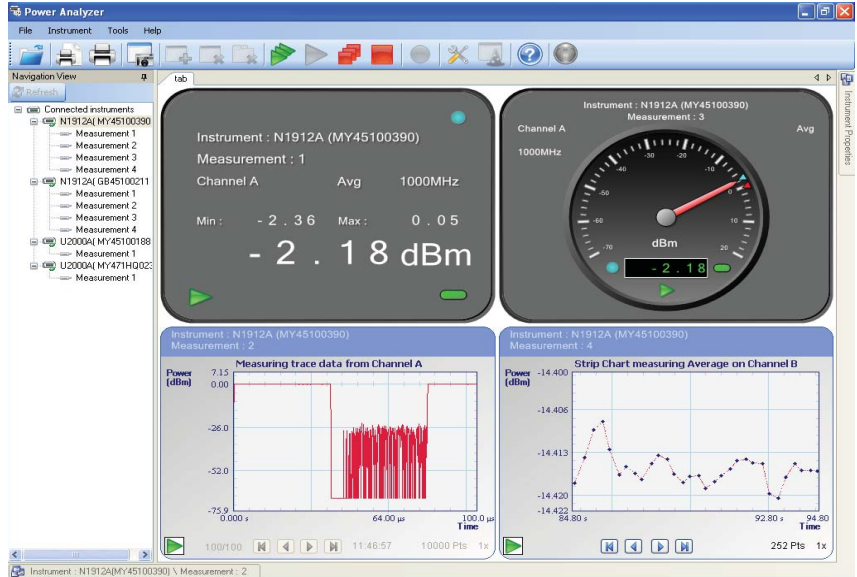


Figure 6. Flexible display formats to meet your needs — soft front panel, analog gauge, trace graph and strip chart

Ideal for manufacturing tests

High measurement speed is essential in high-volume manufacturing of RF and microwave components and systems. Faster testing times will improve your productivity, which in turn enables you to test a greater number of devices in a shorter period of time. The U2000 Series provides a high measurement speed of up to 250 readings per second.

The small form factor also helps you to save valuable production space for other instruments. The optional holster (U2000A-203) allows you to mount your USB sensor on the test rack to avoid sensor damage due to careless handling.

The Power Panel can also display the sensor calibration due date to remind the user that the power sensor is due for calibration. Furthermore, the software will alert users when the due date is approaching. With this feature, you will be able to schedule the sensor calibration period accordingly in order to minimize production down time.

The simplicity, user-friendliness and high degree of accuracy of the U2000 Series make it ideal for troubleshooting. The USB feature makes it very easy for you to add USB functionality to your production line.

Optimized for multi-channel power measurements

The U2000 Series USB Power Sensor is ideal for multi-channel power measurements as in satellite communication systems. By connecting a USB hub to your PC, you can connect more than ten U2000 Series power sensors and display their measurement results displayed simultaneously in the multi-list view of the N1918A Power Panel. Channel mathematical function can also be performed among all the USB sensors.

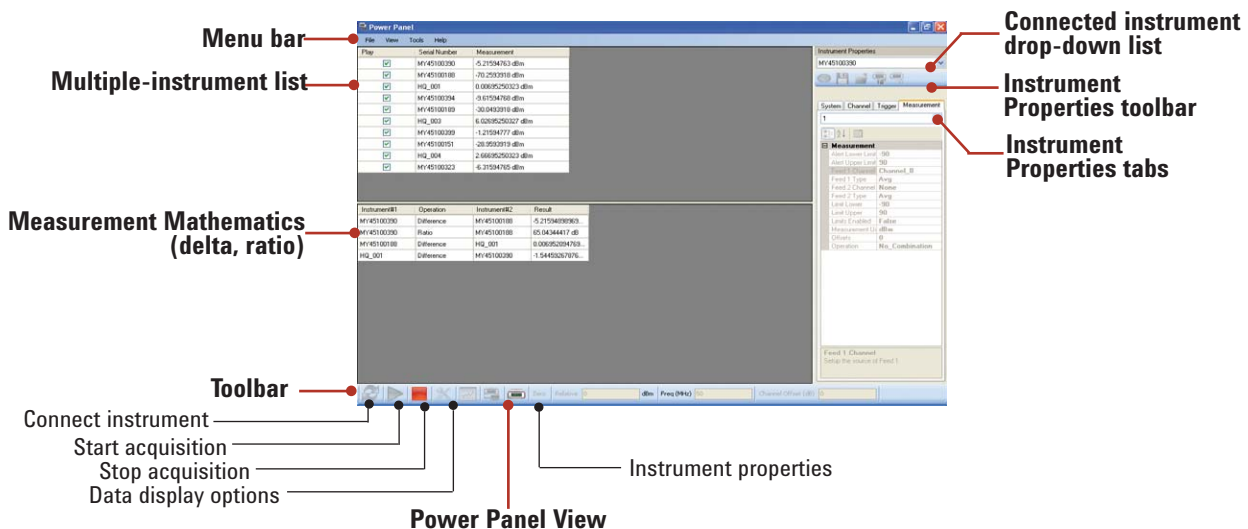


Figure 7: Multi-list view display of N1918A Power Analysis Manager

Ideal for long distance power measurements

The U2000 Series is compatible with the USB-LAN hub. Thus, for long-distance applications such as power measurement for an antenna dish, the USB sensor can be connected to the computer in your control room via a long LAN cable. The Agilent E5813A Networked 5-Port USB to LAN Hub allows you to connect a maximum of five USB power sensors to its USB ports simultaneously. With this flexible LAN connectivity, you can obtain the measured data and monitor the performance of your power sensors at your desk.

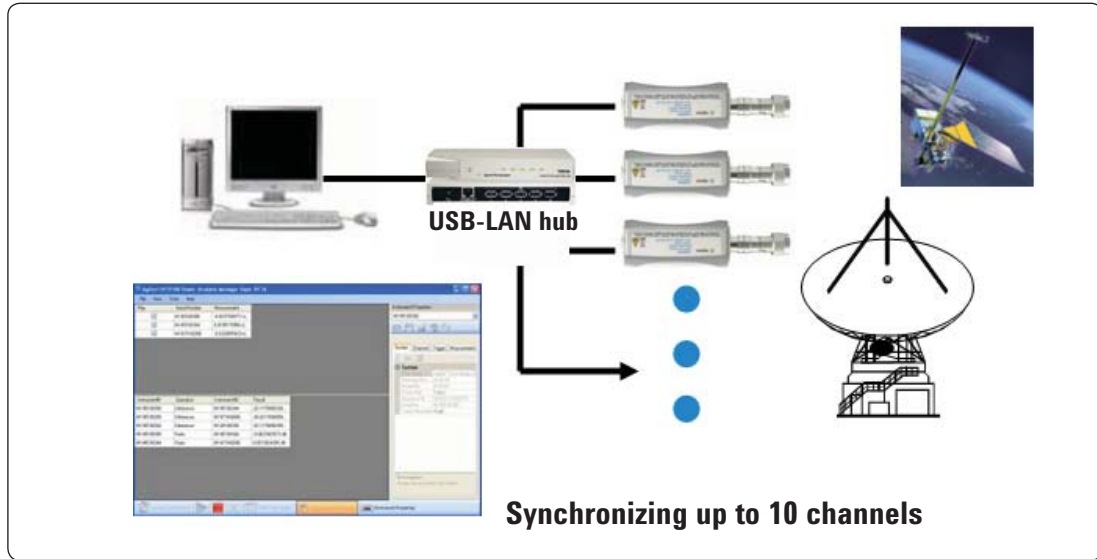


Figure 8. Satellite receiver testing system with multi-channel power measurements on one screen

Great for field application

The U2000 Series USB Power Sensor is the most robust and portable power meter. Its light weight and small size allow field engineers and technicians to easily carry this portable sensor to anywhere, even while climbing the base station tower.

Enables scalar power measurements

Scalar power measurement is a common measurement for RF and microwave devices such as amplifiers or filters. The U2000 Series provides economical scalar power measurements such as gain, gain compression, isolation and return loss (SWR) measurements.

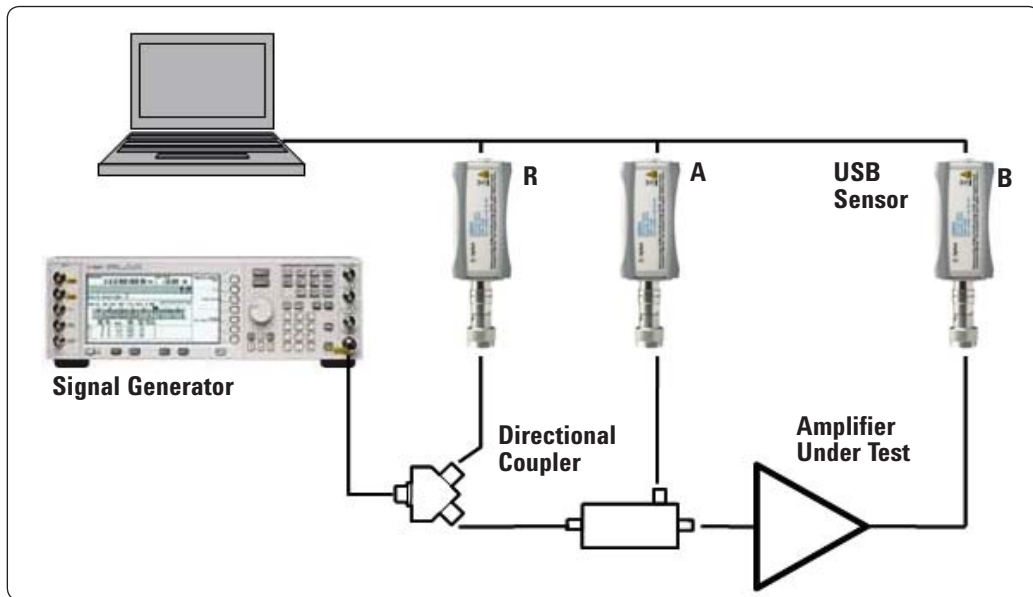


Figure 9: Simplified setup and low cost solution for scalar power measurements

Code-Compatible with E4418B Single-Channel EPM Power Meters

Developing automatic test procedures and programming code are expensive tasks. The Agilent U2000 Series allows you to utilize SCPI programs written for the EPM E4418B power meter, thereby protecting your earlier investments of programming time and money.

Comprehensive Functionality and Easy to Use



Power Panel View

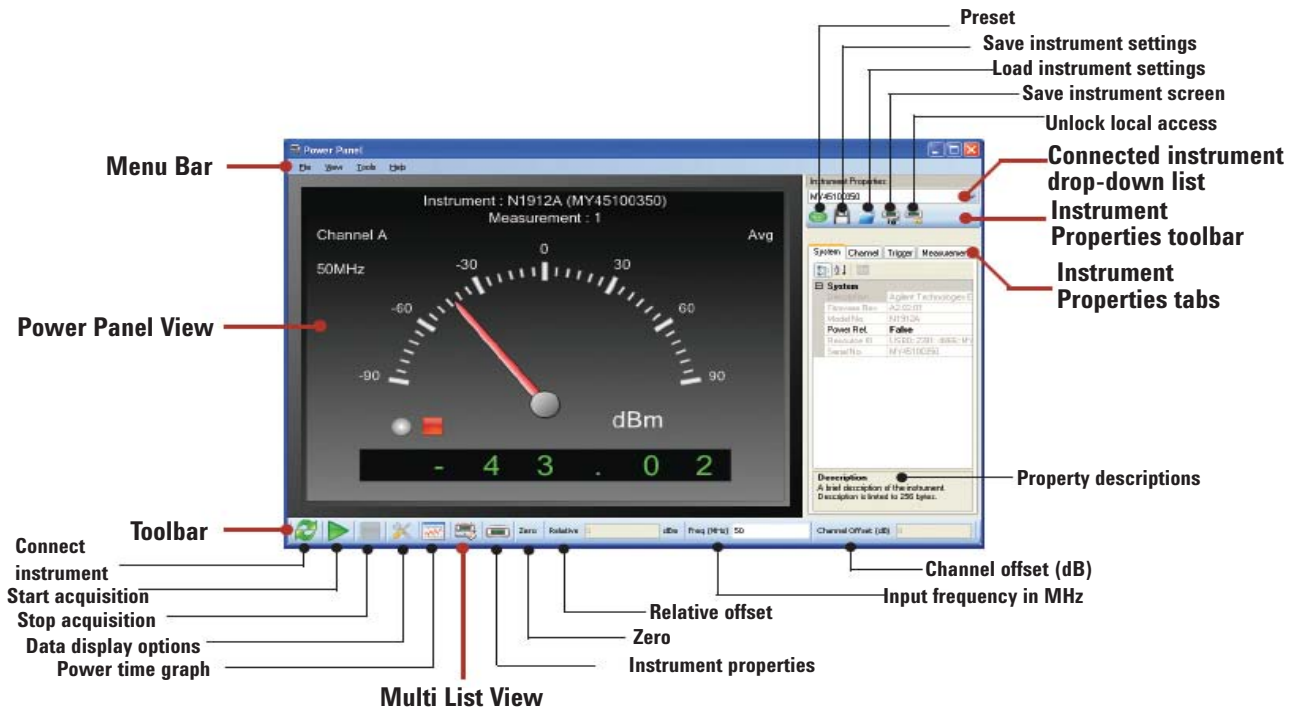


Figure 10: Basic version of N1918A Power Analysis Manager, Panel Panel

Power Analyzer View



Figure 11: Advanced version of N1918A Power Analysis Manager, Power Analyzer

Options and Accessories

Sensor model	Description
U2000A	10 MHz to 18 GHz, –60 dBm to +20 dBm USB Power Sensor, N-type (m)
U2001A	10 MHz to 6 GHz, –60 dBm to +20 dBm USB Power Sensor, N-type (m)
U2002A	50 MHz to 24 GHz, –60 dBm to +20 dBm USB Power Sensor, 3.5 mm (m)
U2004A	9 kHz to 6 GHz, –60 dBm to +20 dBm USB Power Sensor, N-type (m)

Connector Options

U200xx-100: Connector Type-N

Calibration Documentation (Available by end of 2007)

Option U200xx-A6J: ANSI Z540 compliance calibration test data including measurement uncertainties

Option U200xx-1A7: ISO17025 compliance calibration test data including measurement uncertainties

Documentation

A hard copy and CD version of the English language Operating and Service Guide and Programming Guide are provided in the standard delivery of a USB power sensor.

Additional documentation

The Operation and Service Guide is available in the following locales:

U200xx-0B1	English language Operating and Service Guide
U200xx-ABD	German language Operating and Service Guide
U200xx-ABE	Spanish language Operating and Service Guide
U200xx-ABF	French language Operating and Service Guide
U200xx-ABJ	Japanese language Operating and Service Guide
U200xx-ABZ	Italian language Operating and Service Guide
U200xx-AB2	Simplified Chinese Operating and Service Guide

Cables

A 1.5 m USB 2.0 Compliance cable with USB Mini-B connector and locking mechanism (U2031A) to the sensor provided as standard.

Additional cables

U2031A: USB 2.0 Compliance cable with USB Mini-B connector and locking mechanism, length 1.5 meters (5ft)

U2031B: USB 2.0 Compliance cable with USB Mini-B connector and locking mechanism, length 3 meters (10ft)

U2031C: USB 2.0 Compliance cable with USB Mini-B connector and locking mechanism, length 5 meters (16.7ft)

Accessories

U2000A-201 Transit Case	To fit in 4 USB sensors, Operating and Service Guide, Programming Guide, cables.
U2000A-202 Soft Carrying Case	To carry the sensor for field applications
U2000A-203 Holster	To mount on test systems (will be made available at a later stage)

Warranty and Calibration

The standard delivery of each U2000 Series USB Power Sensor includes a 12-month Return-to-Agilent warranty and service plan. For an extension of the initial warranty and service plan to 3 years, order the option below:

R1280A Return-to-Agilent warranty and service plan

R-51B-001-C	1 year Return-to-Agilent warranty
R-51B-001-3C	1 year Return-to-Agilent warranty extended to 3 years

R1282A Return-to-Agilent calibration plan

R-50C-011-3	Agilent Calibration Upfront Support Plan 3-year coverage
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Standard Shipped Components

- ✓ USB power sensor unit
- ✓ U2031A USB 2.0 Compliance cable with USB Mini-B connector and locking mechanism, length 1.5 meters (5 ft)
- ✓ Trigger Cable BNC Male to SMB female 50 ohm, 1.5 meter length
- ✓ Certificate of Calibration
- ✓ N1918A Power Analysis Manager CD
- ✓ Agilent IO Libraries Suites CD
- ✓ N1918A Power Analysis Manager Installation Guide
- ✓ U2000 Series USB Power Sensors Operating and Service Guide
- ✓ U2000 Series USB Power Sensors Programming Guide

Complementary Equipment

- ✓ Agilent E5813A: NETWORKED 5-PORT USB to LAN HUB, for multi-channels and long-distance operation. Users can connect an extended long LAN cable between the USB-to-LAN hub and a computer.
- ✓ Commercially available USB hub for multi-channel operations

For More Information

Agilent provides free, detailed product and application notes:

- [1] *Fundamentals of RF and Microwave Power Measurements (Part 1), application notes 1449-1*, literature number 5988-9213EN
- [2] *Fundamentals of RF and Microwave Power Measurements (Part 2), application notes 1449-2*, literature number 5988-9214EN
- [3] *Fundamentals of RF and Microwave Power Measurements (Part 3), application notes 1449-3*, literature number 5988-9215EN
- [4] *Fundamentals of RF and Microwave Power Measurements (Part 4), application notes 1449-4*, literature number 5988-9216EN
- [5] *Steps for Making Better Power Measurements, application note 64-4D*, literature number 5965-8167EN
- [6] *Choosing the Right Power Meter and Sensor, product note*, literature number 5968-7150E

Related Literature

- [1] *U2000 Series USB power sensor datasheet*, literature number 5989-6278EN
- [2] *U2000 Series USB power sensor technical overview*, literature number 5989-6279EN
- [3] *U2000 Series USB power sensor configuration guide*, literature number 5989-6281EN
- [4] *U2000 Series USB power sensor demo guide*, literature number 5989-6280EN



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Remove all doubt

Our repair and calibration services will get your equipment back to you, performing like new, when promised. You will get full value out of your Agilent equipment throughout its lifetime. Your equipment will be serviced by Agilent-trained technicians using the latest factory calibration procedures, automated repair diagnostics and genuine parts. You will always have the utmost confidence in your measurements.

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