Product Brochure

Anritsu Advancing beyond

ML2439A

Power Meter

ML2439A Power Meter and Sensors

Introduction

The ML2439A provides design engineers and technicians the utility of traditional benchtop instrument, the flexibility and performance of modern USB power sensors, and the simplicity of a multi-touch display.

As a benchtop meter, the ML2439A provides a standalone solution for capturing, displaying, and analyzing peak and average/RMS power in both the time and statistical domains through an intuitive, multi-touch, touch-screen display.

The ML2439A Power Meter utilizes up to four Anritsu USB power sensors with industry-leading performance and capabilities either independently or for synchronized multi-channel measurements of CW, modulated, and pulsed signals.

Providing the ultimate flexibility, the Anritsu USB power sensors can be disconnected and independently used as standalone instruments.

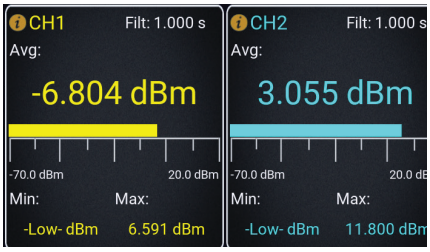
Key Features

- Capture/display/analyze peak and average/RMS power
- Frequency range from 10 MHz to 50 GHz
- Industry-leading video bandwidth (195 MHz) and rise time (3 ns)
- Industry-leading 100,000 measurements per second
- Industry-leading 100 ps time resolution
- Synchronous multi-channel measurements (up to 4 channels)
- Sensors can be used as standalone instruments

ML2439A Power Meter

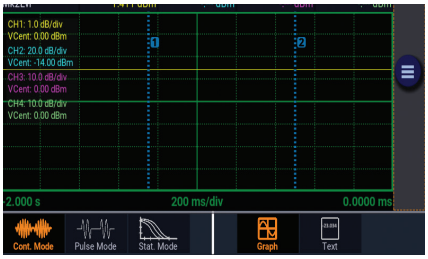
The ML2439A's intuitive, multi-touch display enables fast configuration of up to four sensors as well as easy access to measurement and analysis tools, providing a standalone solution for capturing, displaying, and analyzing peak and average power in both the time and statistical domains. The meter also incorporates a test source to verify sensor operation.

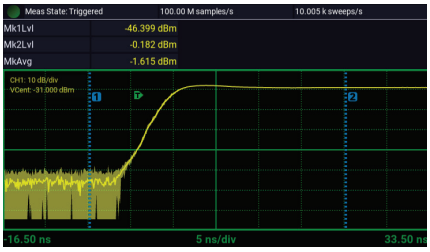
Measurement Modes



Continuous Mode

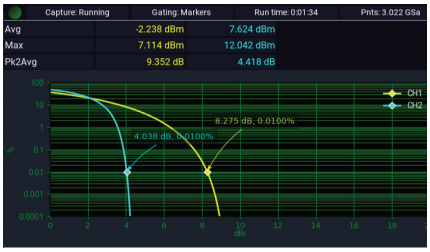
For simple, intuitive measurements of repetitive waveforms, the ML2439A Continuous Mode of operation in graph and text views provides a numeric display of average, maximum and minimum signal powers.





Pulsed Mode

Analysis of fast-rising single pulses or pulses with short pulse repetition intervals (PRIs) requires an instrument with sophisticated trigger and data acquisition capability. Within Pulsed Mode, graph view displays pulse amplitude vs time. More than 16 pulse parameters can be measured in text view.



Statistical Mode

In Statistical Mode, the ML2439A plots the Complementary Cumulative Distribution Function (CCDF). The CCDF plot shows the rate of occurrence of a specific crest factor for signals, such as those used in 5G, 4G/LTE, and Wi-Fi applications.

High-Performance and Versatile USB Power Sensors

The Anritsu ML2439A Power Meter utilizes Anritsu families of USB power sensors with industry leading performance and capabilities. All sensors incorporate unique Real-Time Power Processing™ technology, which virtually eliminates gaps in measurement suffered by other power sensors and enables industry best measurement speeds. In terms of performance, the series Real-Time Peak Power Sensors are the fastest responding sensors with 3 ns rise times and 195 MHz of video bandwidth. Real-Time True Average Power Sensors enable the lowest frequency measurements for diode-based average power measuring sensors and can make accurate measurements virtually independent of signal modulation bandwidth. Sensors offer flexible connectivity and performance leadership at an excellent price point.

MA244xxA Series Real-Time Peak Power Sensors

- 6 GHz, 8 GHz, 18 GHz, and 40 GHz models
- Up to 195 MHz VBW and 3 ns rise time
- 100,000 measurements per second
- Real-time processing of power readings
- 100 MS/s continuous and 10 GS/s effective sampling rates
- 100 ps time resolution for rising/falling edge measurements
- Full pulse profiling
- Crest factor, CCDF and statistical measurements

MA241xxA[1] and MA242xxA True RMS CW Power Sensors

- Frequency range: 10 MHz to 18 GHz
- Power measurement range: +20 dBm to –60 dBm
- True RMS measurements – modulation independent
- Fast measurement speed: >1,600 readings/s continuous, >11,000 readings/s buffered
- No Zeroing required above –45 dBm
- Able to accept high power levels before being damaged: +30 dBm CW, +34 dBm, 10 µs

[1] *MA24103A, MA24105A, and MA24106A not supported.*

MA243xxA Series True RMS CW Power Sensors

- Frequency range: 10 MHz to 50 GHz
- Power measurement range: +20 dBm to –70 dBm
- CW average power measurements
- Fast measurement speed: >2,100 readings/s continuous, >5,600 readings/s buffered
- Able to accept high power levels before being damaged: +26 dBm CW, +32 dBm, 10 µs
- No Zeroing required above –45 dBm

All Anritsu USB Power Sensor Feature

- NIST traceable calibrations
- Compatible with Anritsu handheld instruments
- Silicone protective covering for additional field durability
- Worldwide calibration and service centers

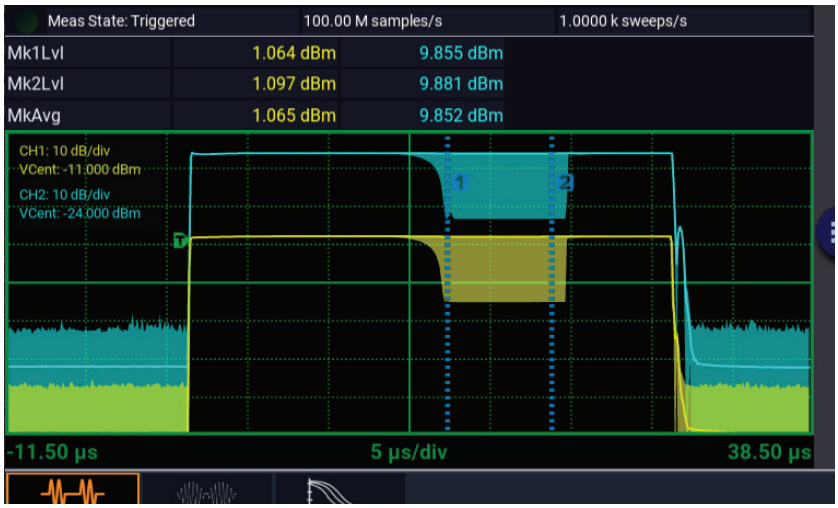
Real-Time Power Processing

Real-Time Power Processing[1] (RTPP) dramatically reduces the total cycle time for acquiring and processing power measurement samples. By combining a dedicated acquisition engine, hardware trigger, integrated sample buffer, and a real-time optimized parallel processing architecture, Real-Time Power Processing™ performs most of the sweep processing steps simultaneously, beginning immediately after the trigger instead of waiting for the end of the acquisition cycle.

The advantages of the Real-Time Power Processing technique are that key processing steps take place in parallel and keep pace with the signal acquisition. With no added computational overhead to prolong the sweep cycle, the sample buffer cannot overflow. As a result, there is no need to halt acquisition for trace processing. This means gap-free signal acquisition virtually guarantees that intermittent signal phenomena such as transients or dropouts will be reliably captured and analyzed.

[1] *RTPP is available within the MA24400A series sensors.*

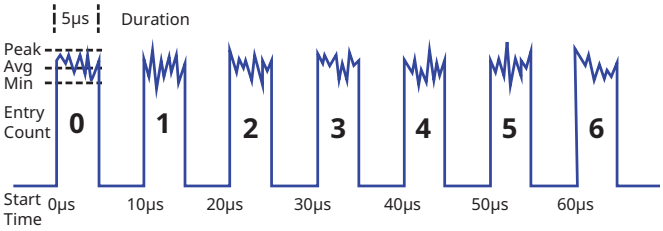
Dropouts, such as those shown are the sorts of events often missed by conventional power meters due to the acquisition gaps while processing takes place.



Measurement Buffer Mode[1]

The Measurement Buffer Mode is a remote control function that works in conjunction with Real-Time Power Processing to provide only the relevant burst or pulse information, eliminating the need to download and post-process large sample buffers. As a result, users can collect and analyze measurements from a virtually unlimited number of consecutive pulses or events without gaps. A wide variety of parameters can be calculated and plotted, such as duty cycle, pulse repetition rate, pulse width variation, and pulse jitter. In addition, anomalies, such as dropouts, can be identified.

[1] *Available within MA24400A sensors*



Example Seven Pulse Waveform

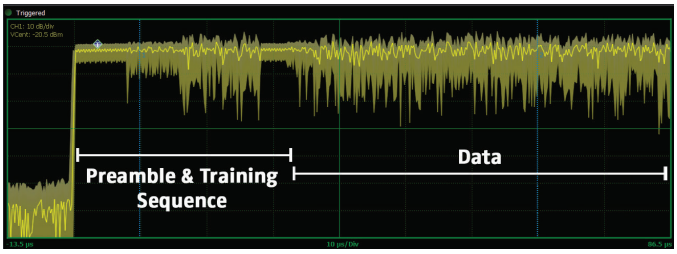
Entry Count	Interval Start	Interval Duration	Interval Average	Interval Minimum	Interval Peak
0	0.00 us	5.01 us	–0.043 dBm	–39.042 dBm	8.826 dBm
1	9.99 us	5.00 us	–0.006 dBm	–38.431 dBm	8.827 dBm
2	19.99 us	5.01 us	0.039 dBm	_41.549 dBm	9.742 dBm
3	30.00 us	5.00 us	0.017 dBm	–38.551 dBm	9.8021 dBm
4	40.01 us	5.00 us	0.022 dBm	–40.699 dBm	9.477 dBm
5	49.99 us	5.00 us	–0.020 dBm	–39.706 dBm	8.102 dBm
6	60.00 us	5.99 us	0.036 dBm	–37.803 dBm	9.750 dBm

Measurement Buffer Data Returned for Waveform in Above

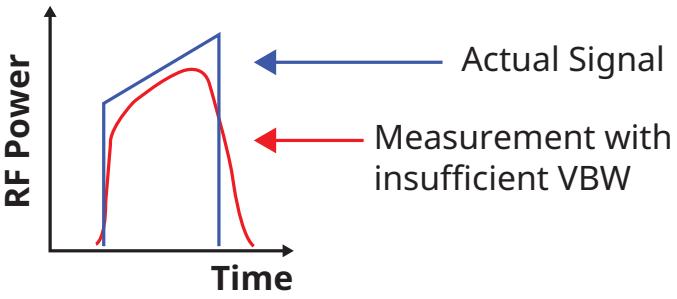
Addressing Communications and Radar Measurement Challenges

Wi-Fi and Wireless Communication Signal Analysis

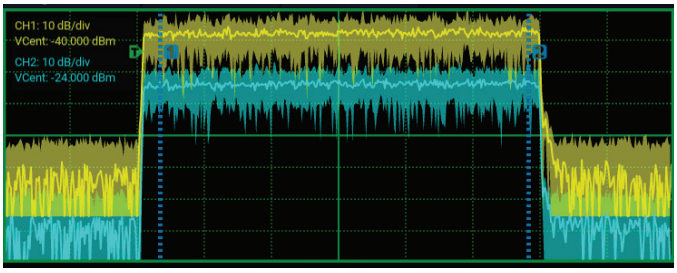
Characterization and compliance testing of Wi-Fi and LTE chipsets and devices involves significant challenges for design and test engineers. With multiple-input, multiple-output (MIMO) architectures and channel bandwidths up to 160 MHz, testing is complex, especially when measuring power per channel and time alignment between channels. The ML2439A enables packet power measurements to be performed independently on multiple synchronous or asynchronous transmit chains with a common timebase shared among sensors.

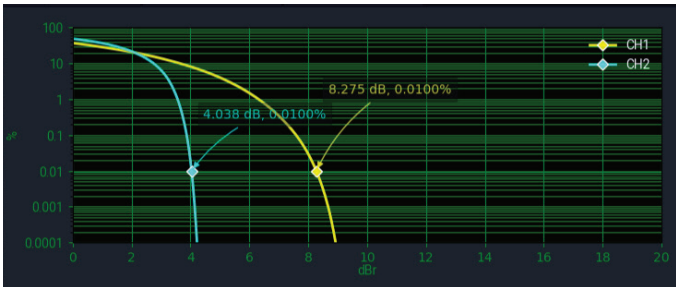


Use markers to define a portion of the waveform on which to make measurements. **"Between Marker" measurements** are ideal for monitoring specific portions of a packet over long intervals.



Video bandwidth (VBW) describes the ability of a power sensor to track peak (envelope) power. Insufficient VBW will result in errant envelope and average power measurements. The ML2439A offers the **widest video bandwidth (195 MHz)** making it ideal for measuring 80 MHz, 100 MHz, and 160 MHz channels.



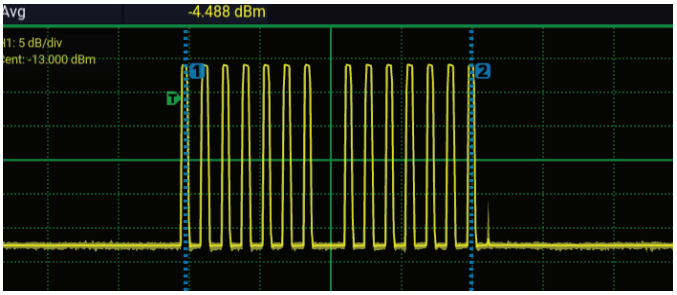


By comparing the peak-to-average power ratio, or crest factor (CF), of input and output signals of an transmission chain, engineers can assess circuit linearity. Additional insight can be provided with the ML2439A statistical mode **Complementary Cumulative Distribution Function (CCDF)** plot displaying the rate of occurrence of a specific CF. As an amplifier output compresses, the CF will reduce and the CCDF plot will move left.

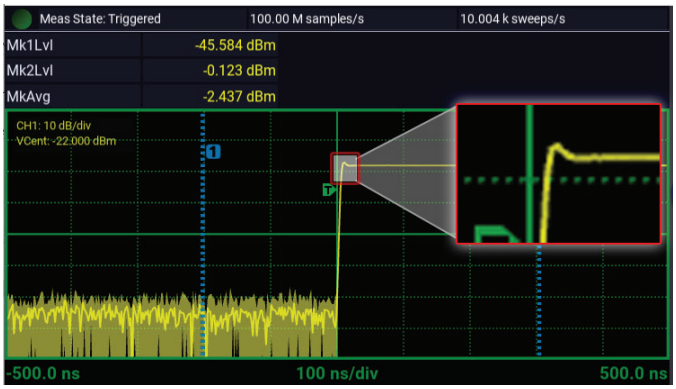
Addressing Communications and Radar Measurement Challenges

Secondary Surveillance Radar (SSR)

Design, verification, troubleshooting and maintenance of secondary surveillance radar (e.g. IFF-based radar) has never been more demanding.



Proper design and operation of SSR systems is critical to the safety and security of aviation. The ML2439A can be used to easily and accurately capture SSR waveforms. Markers enable measurements on specific portions of the waveform.



Industry-leading rise time (< 3 ns) enables characterization of the most demanding radar signals.

Utilize the **superior 100 ps time resolution** to zoom and uncover signal characteristics that might otherwise be missed.

Param	CH1	CH2
Width	30.080 µs	30.012 µs
Rise	21.061 µs	21.132 µs
Fall	22.395 µs	23.404 µs
Period	999.77 µs	999.89 µs
PRF	1.0002 kHz	1.0001 kHz
Duty	3.01%	3.00%
Offtime	969.69 µs	969.88 µs
WavAv	-14.158 dBm	-5.348 dBm
PulsAv	0.484 dBm	9.445 dBm
PulsPk	1.327 dBm	10.098 dBm
OvrSht	0.290 dB	0.110 dB

Users can take advantage of the ML2439A automated pulse measurement feature to measure and calculate 16 common power and timing parameters and display the parameters of interest: rise-time, fall time, pulse width, off-time, period, pulse repetition frequency, duty cycle, pulse peak, pulse overshoot, pulse average,waveform average, top level power, droop, bottom level power, edge delay, and pulse edge skew between channels.

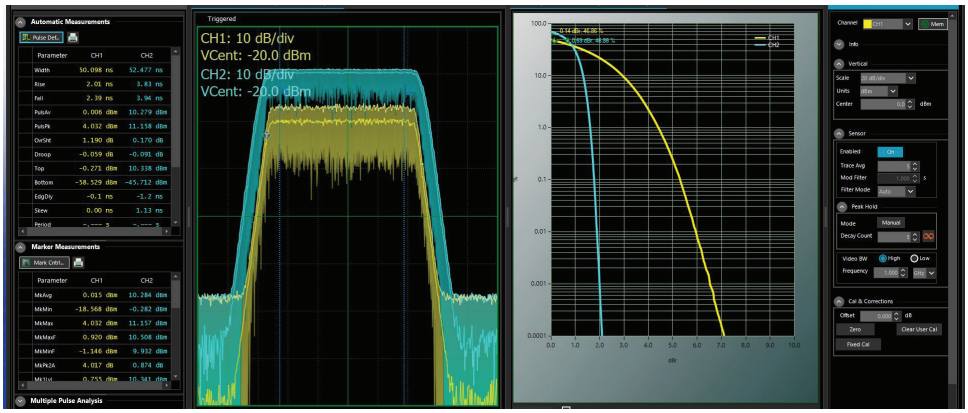
Power Expert Functionality

Power Analyzer (MA24400A Sensors)

Power Analyzer is a complimentary PC-Based software application for sensor control, measurement configuration, and advanced analysis.

Key Features and Functionality

- Data displayed as numerical meter or waveform trace
- Statistical analysis with CCDF plot
- Multiple marker measurements, including between marker data and marker ratios
- Automated measurements; e.g., 16 automated pulse measurements
- Export measurement data in .csv or .pdf formats
- Up to eight simultaneous power measurement channels
- Simulation mode available to preview functionality when a sensor is not available

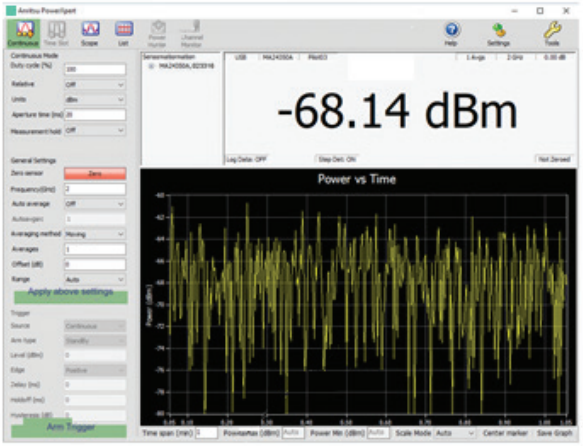


PowerXpert (MA24100A, MA24200A and MA24300A Sensors)

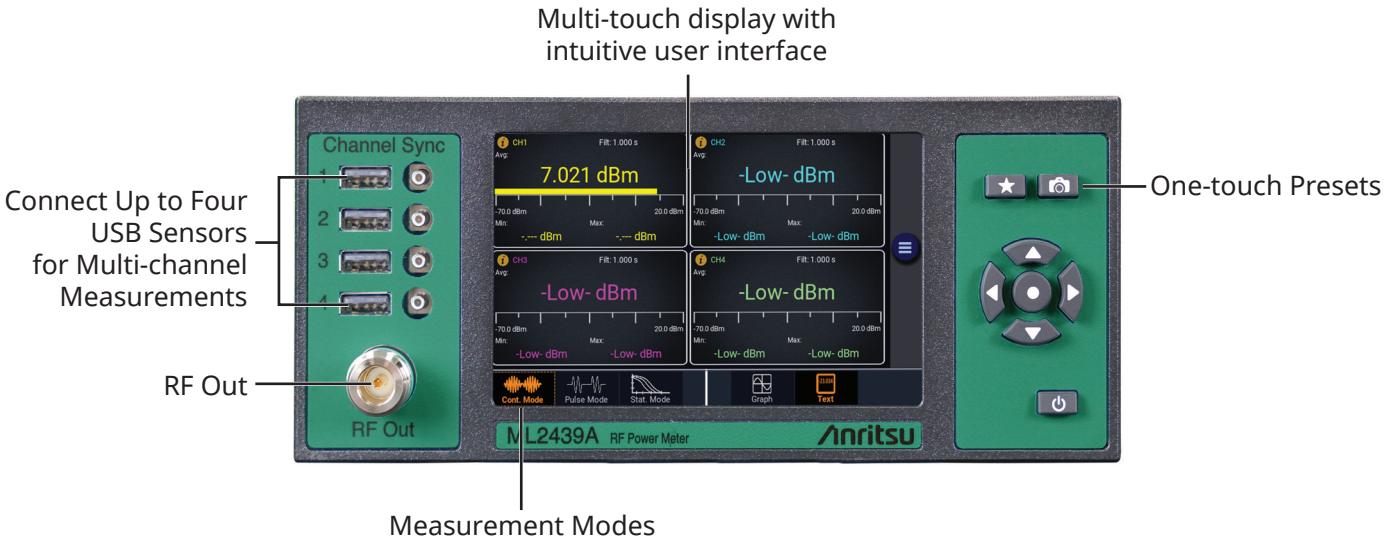
PowerXpert is a complimentary PC based application which supports all Anritsu power sensors.

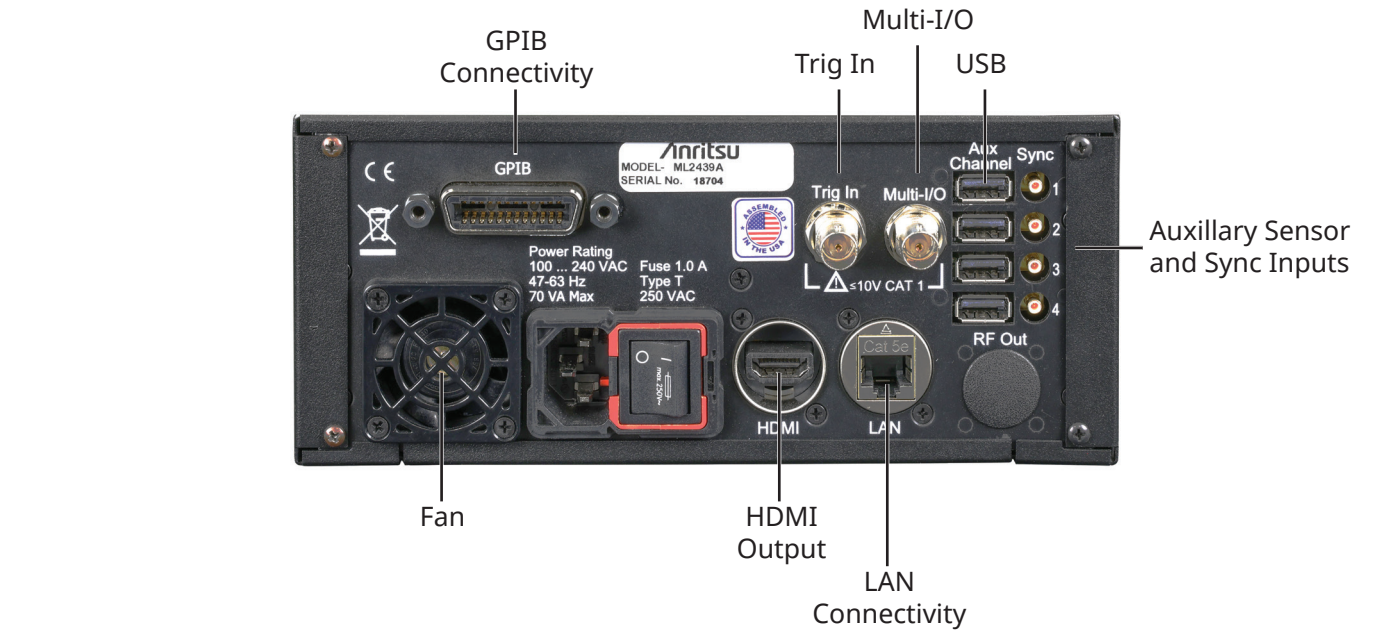
Key Features and Functionality

- Multiple Sensor Display – Up to 8 sensors
- Data displayed as numerical meter or waveform trace
- Continuous Mode, Time Slot Mode, Scope Mode and List Mode
- Gate and Fence mode to measure select portion of the waveform (Sensor dependent)
- Up to 1000 measurements with different settings for each measurement (sensor dependent)
- Standby Auto Arm, Single Arm and Multi Arm trigger states
- Screen capture and data logging



Power Expert Functionality





Ordering Information

Model Number	Description
ML2439A	Power Meter, 2-Channel
Options	
ML2439A-0004	Add Two Active Channels
ML2439A-1004	Retrofit, Add Two Active Channels
ML2439A-0005	GPIB Interface
ML2439A-1005	Retrofit, GPIB Interface
ML2439A-0006	External USB Boot
ML2439A-1006	Retrofit, External USB Boot

Standard Accessories

Part Number	Description
11410-00976	Information Card (provides information on where to download the latest manual, software, utilities)

Optional Accessories

Part Number	Description
2000-2154-R	External USB Drive (for Option -0006)
2000-2155-R	19” Rack Mount Kit

Anritsu Advancing beyond

Specifications are subject to change without notice.

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