

ML2400A Power Meters & MA2400A/D Sensors

The Anritsu Family of Pulse, Wideband and CW Power Meters and Power Sensors



Anritsu

ML2496A Power Meter

AMP2411R Cf 100.0% Save/Recall
3 No Sensor Cf 100.0% Save Settings
CH1 -15.00 dBm 5.00 dB
dBm
-2.00 μ s 18.00 μ s
Radar Pulse Test
Gate 1
Rv 9.29 dBm 3.44 μ s
Rv 3.96 dBm 93.82 ns
Rv 9.47 dBm 2.00 μ s

Calibrator

B

Anritsu

MA2496A/D Power Sensor

Ideal Solutions for Average, Peak, and Crest Power Measurements

PowerSuite

Free software available for all the power meters. Continuously view measurement traces on your PC in real-time, or archive data and plots for later analysis. PowerSuite runs on a standard PC running Windows® 95 (or higher), via GPIB or RS232.

Anritsu Power Meters and Power Sensors: Accurate, Fast, and Affordable.

Anritsu offers the world's most comprehensive range of power meters. The ML2490A series has the performance required for narrow fast rising-edge pulse power measurements (e.g., radar), while the ML2480A series is suited for Wide-band power measurements on signals such as W-CDMA, WLAN, and WiMAX.

The ML2430A series of power meters are designed for CW applications, offering a combination of accuracy, speed and flexibility in a low cost package.

With five different families of Power Sensors to choose from, you can trust you'll find the right combination for precision power measurement, whatever your application.

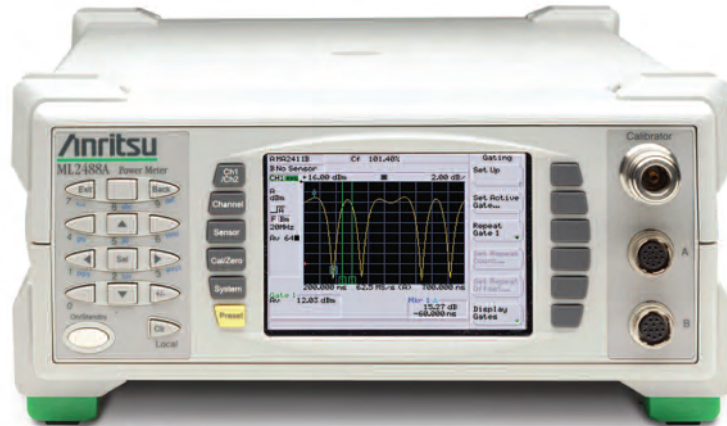


ML2490A Series

- **High Performance and Precision.** 65 MHz instrument bandwidth, with 1 ns measurement resolution for precise rise time measurements of radar signals or for measuring the latest 4G Orthogonal Frequency Division Multiplex (OFDM) signals.
- **High Speed Sampling.** Up to 1 Gs/s sample rate produces accurate profiles of radar, W-CDMA, WLAN/WiMAX and latest generation cellular systems. Displays peak, average and crest factor of any input signal.
- **Trigger.** Comprehensive facilities offer precise triggering using internal or external sources. Continuous or single shot modes available.
- **Measurement Gates and Markers.** Multiple Gates and Markers for measuring: Peak power, Multi-pulse power, Signal droop, Rise time and Fall time, Pulse width, PRI.
- **External Video.** Provides 1/4 VGA signal to external monitor.



Select the Optimum Power Meter for Your Application



ML2480A Series

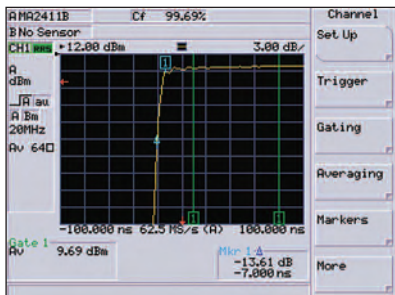
- **20 MHz Instrument Bandwidth.** Designed for accurate peak and average power measurements on 3G (W-CDMA), WLAN and WiMAX technologies.
- **Continuous Wave (CW) Meter Mode.** High accuracy and high dynamic range CW power measurements—the 50 MHz/1 GHz calibrator calibrates all Anritsu sensors. Frequency is automatically selected.
- **Soft Keys.** Menu-driven operation simplifies test procedures.
- **Preset.** Built-in measurement set-ups for widely available wireless systems such as GSM, W-CDMA, WLAN and Bluetooth.



ML2430A Series

- **Fully-Featured General Purpose Power Meter.** Ideal for CW applications, offering a combination of speed, accuracy and flexibility in a low cost package.
- **Designed for Field Applications.** Portable and rugged, splash-resistant chassis design handles the roughest field treatment. Add a front panel cover and soft case for further protection. There is also an optional NiMH battery, providing six hours continuous operation.
- **Graphics Display.** Provides graphical display of pulsed power or TDMA signals, displaying individual time slots. Frame triggering allows the user to measure the average power across a time slot.

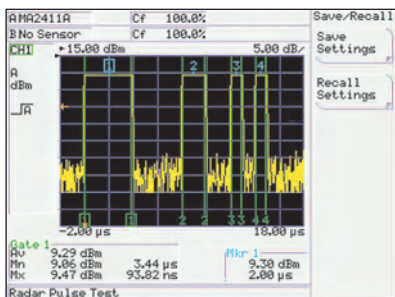
Ready for the World's Most Demanding Applications



High resolution for observing fast rising-edge signals.



Accurate CW measurements.



Examine pulses in detail and capture the entire pulse train.

Radar Systems

The high bandwidth and sample rate of the ML2480A and ML2490A provide accurate peak measurements on a variety of radar, radio-navigation and radio-location systems.

The ML2480A and ML2490A series has a number of features tailored for peak power measurement on pulsed systems. With a typical 8 ns rise time, and a 1ns resolution on the measurement, the ML2490A and MA2411B power sensor have the performance to look at the rising edge of radar signals.

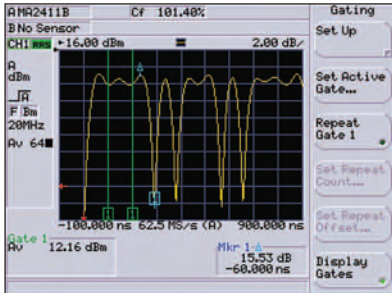
Another benefit of the power meter is that it can be easily set up to trigger on a pulse or sequence of pulses. Users can set up to four independent gates to measure the average, max and min powers on a sequence of pulses. The data for the max and min includes the timestamp and gives the user automatic display of the position and value of the maximum overshoot and minimum undershoot in each pulse.

Here are some more functionality highlights of ML2480A and ML2490A power meters:

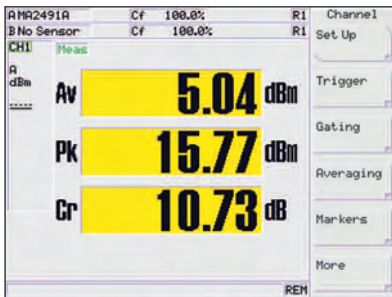
- Automatic marker functions provide pulse rise time, fall time, off time and Pulse Repetition Interval. A delta marker can be set up to measure the droop of the pulse top.
- Trigger event display is available in the ML2490A as either arrows on the border of the screen or as an adjustable trigger event waveform. All timings for the gates and markers are taken from the trigger event.
- Read true output power—The offset table function corrects the power meter reading when the power meter is being used with a coupler or high power attenuator in a radar test system.



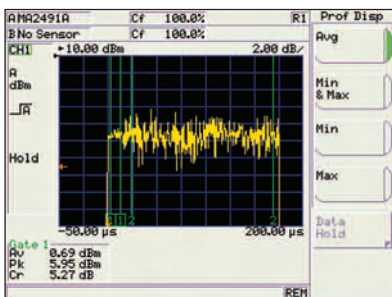
Measurement Solutions for High-Speed Wireless Systems



Accurately track the signal envelope for average and peak power.



Use readout facility to enhance the display.



Measurement gates and markers for observing precise sections of the signal.

WLAN / WiMAX Solutions

WLAN and WiMAX technologies are playing an increasingly significant role in the design and installation of high-speed networks. What's more, these transmission technologies have developed faster than the traditional power meter, leaving users with inaccurate power measurements.

The ML2480A and ML2490A series have been designed to meet the challenge of today's fast-paced WLAN and WiMAX technologies. Users can measure the peak power of current and future wideband OFDM systems (such as 802.11a/g and 806.16) and configure the display to measure Average, Peak and Crest Factor. Dithered sampling ensures accurate measurements on wideband high data rate carriers under continuous transmission.

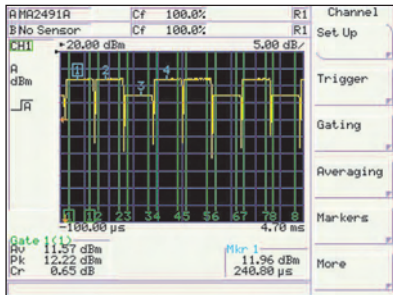
Users will no longer need to manually apply correction for peak power readings because the wide 65 MHz and 20 MHz video bandwidth enables high accuracy peak power measurements on the most demanding power envelope conditions.

Also, the wide bandwidth of the signal channel allows for accurate placement of the measurement gates. Users can hone in their analysis by taking advantage of the multiple gate facility and measuring precise selections of the signal such as the OFDM training sequence at the start of the 802.11g signal and the data payload section.

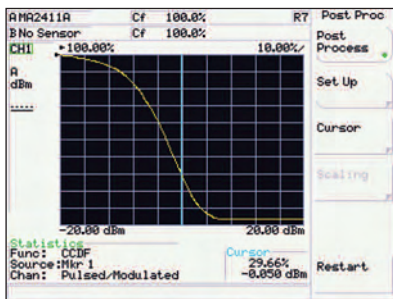
Other functions users can take advantage of:

- A built-in preset to instantly set up and measure continuous OFDM.
- CCDF, CDF and PDF supported statistical functions on the OFDM measurements.

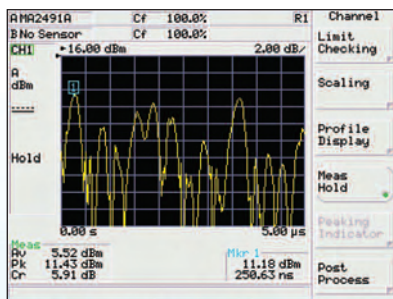
Making GSM/EDGE/GPRS measurements as easy as 1, 2, 3



EDGE and GPRS measurements made simple.



Built-in Statistical analysis tool.



Determine signal Crest factor with ease.

GSM/EDGE/GPRS Systems

The straightforward and seamless combination of the graphical display and the measurement gates makes GSM and PCS systems measurements so easy to take, it's elementary.

For GSM systems the power meter is set up to trigger on the GSM pulse. The active gate is set up to measure the power within the 10% to 90% section of the burst profile in order to meet the specified limits. An automatic limit can be used to give a pass or fail indication. The display shows the results from the active gate, indicating the average power within the burst.

GPRS and GSM test modes take advantage of the power meter's multiple gates. Users can repeat a GSM gate pattern up to eight times—allowing the power meter to capture and read back the power from each of the slots—giving up to eight simultaneous measurements.

Making EDGE measurements has never been easier or faster. The power meter's high sample rate leads to improved settling time. And the use of the trigger hold-off facility prevents re-triggering on the symbol transitions. What's more, PHS and IS136 systems can also be measured in this way—just as fast, and just as effective.

3G CDMA Systems

Designed to measure the peak power of all the major CDMA systems in the world, the ML2480A and ML2490A series covers all the system bases, including those that use Time Division Duplexing such as TD-SCDMA.

Users can configure the display to measure Average, Peak and Crest Factor during the measurement period for FDD systems. TDD systems can be displayed as a graph profile and the measurement gates can be set to measure and display the Peak and Crest Factor during the data payload transmission.

Statistical functions (CCDF, CDF and PDF) are supported on CDMA measurements to enable the designers of power amplifiers to correctly estimate the margins on the peak power handling capabilities of their design.

The ML2480A and ML2490A series also allow the user to:

- See the actual power envelope variations in the signal via the high-speed profile display.
- Measure gain and output power of the amplifier under CDMA transmission conditions through the ML2488A dual input (in ratio mode).
- Leverage the wide bandwidth of the MA2411B and M2490/91A sensors and the power meter to easily measure multiple channel carriers in an allocated spectrum block.

The Information You Need, Right Where You Want It

Amplifier Measurements

Power amplifiers designed for peak applications, whether pulsed or CDMA, cannot operate at full peak power with CW test inputs. The gain and output power can only be measured accurately using a peak power meter under representative conditions.

For the precise characterization of amplifier output power and gain, the ML2438/88/96A power meters are true dual channel meters, with two independent signal channels that eliminate multiplexing. Gain and output power are measured simultaneously. And fast responding diode sensors respond immediately to changes in power level to reduce total test time.

With the ML2496A and ML2488A users can also make Power-Added Efficiency (PAE) measurements. The amplifier bias voltage can be entered manually or over GPIB and the bias current can be measured using a current probe connected directly to the power meter.

Return Loss Measurements

Take advantage of the power meter's dual inputs to measure the return loss of an amplifier under correct operating conditions.

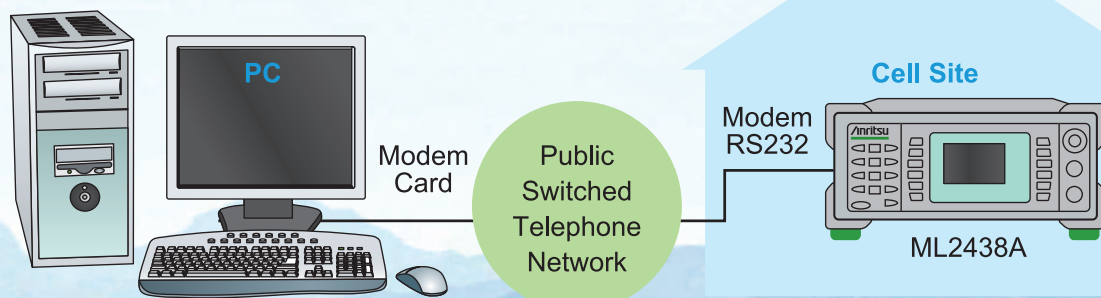
Frequency Sweep and Power Sweep

The Anritsu ML2400A series of power meters are designed to function with Anritsu MG3690B synthesised generators or sweepers to form an integrated test solution for swept power and frequency measurements.

The MG3690B requires Analog Sweep Option 6 to be fitted for this function.

Remote Monitoring

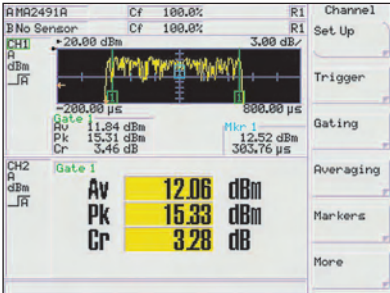
The ML2430A series automatically calls a pre-entered phone number whenever a limits threshold is exceeded. Just set the limit level, enter the phone number and connect a modem.



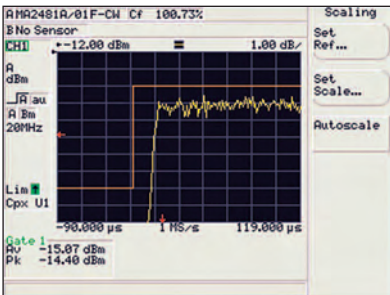
Make house calls without leaving the lab.

The ML2430A's data acquisition settings can also adjust to monitor average power or the burst power of specific timeslots. The RS232 port uses the same commands as the GPIB. Contact your Anritsu representative for PC-compatible software.

Features Loaded into Every Power Meter



Flexible measurement display.



Time-varying limits, user-defined or Preset.

Dual Display Channel

Each display channel in the Anritsu ML2480/90A Power Meter is a measurement set up and can use any selection or combination of the sensor inputs. View one display channel or two. Switch between display channels quickly via the front panel hard 'hot' key. The user can also choose to view the measurement results as a graph profile or numerical readout.

Sampling Modes

The ML2490A series power meter automatically chooses between continuous (time capture above 3.2 μ s) or repetitive (50 ns to 3.2 μ s) sampling to build up the trace to 1 ns settable display resolution. The ML2480A provides up to 64 MS/s sampling with resolution of 16 ns. The user may also opt to adjust the sample rate directly.

Test Limits

- A simple power limit can be set up for many applications to test the upper and/or lower boundaries of the signal.
- A time varying limit line can be set up to for pulsed systems such as radar, TDMA phone systems or WLAN and tests all aspects of the pulse profile.

Settings Stores

Conveniently recall application-specific measurement set ups.

Secure Mode

The power meter series have a secure mode for operation in security sensitive environments. On activation, the secure mode wipes all information stored in the non-volatile RAM on power up.

GPIB

Comprehensive command-set for full functionality over GPIB.

RS232

For control and firmware updates.

Analog Voltage Input

Measures voltage or accepts the V/GHz signal from a synthesiser for automated sensor calibration factor correction or Power Added Efficiency (PAE).

Analog Outputs

Support corrected and scaled measurements or real-time dual channel output. Synthesiser interface controls include zero blanking.

Discover a Comprehensive Range of Power Sensors

Power Sensors for every application

Anritsu's five families of coaxial power sensors have been designed with just one thing in mind: everything. The range of sensors provide frequency coverage to 50 GHz, with dynamic range up to 90 dB.



Family of power sensors designed to cover a wide range of measurement applications.

The sensors employ diodes and offer greater speed, sensitivity and dynamic range than thermal sensors. The sensors are based on half or full wave diode rectifiers constructed from zero bias Schottky diodes. The rectifier output is low-pass filtered, forming an envelope detector. This post-detection bandwidth is sometimes referred to as the Video bandwidth and is a measure of how quickly the power sensor can respond to a changing input signal such as a radar pulse or a multi-carrier OFDM signal.

Pulse and Wideband Sensors: MA2490/91A and MA2411B

The MA2490A and MA2491A have been designed as dual purpose Wideband and CW sensors. An FET switch is used to chop the signal from the sensor, to improve stability at low power levels, in CW mode. These sensors have 20 MHz video bandwidth and 18 ns rise time in the pulse modulated mode, and can be used to make average, peak and crest measurements on signals with rapid amplitude change such as W-CDMA, WLAN, WiMAX and radar.

The pulse sensor MA2411B has been specifically designed for a wide video bandwidth of 65 MHz, providing a fast rise time of better than 8 ns. This power sensor does not contain a FET switch for low-level CW applications. Use this sensor for the most demanding rising edge measurements such as radar, and wideband measurements on OFDM, multi-carrier signals.

Standard Diode Sensors: MA2470D

Designed for high dynamic range, high accuracy CW and TDMA measurements. These power sensors have 90 dB dynamic range and linearity better than 1.8% making them the choice for precision measurements. The rise time of these sensors is fast enough for power measurements on GSM and similar TDMA systems that use GMSK modulation.

Power Sensors for Every Application

High Accuracy Diode Sensors: MA2440D

With its built in 3 dB attenuator, the MA2440D minimizes input VSWR and are best used where the best measurement accuracy is required over a large dynamic range, for example when measuring amplifiers. High accuracy diode sensors have a dynamic range of 87 dB compared to the 90 dB of standard diode sensors. In all other respects the performance of the sensors is identical to the standard diode sensor.

Universal Power Sensors: MA2480D

The MA2480A series are true RMS sensors with a dynamic range of 80 dB. These power sensors can be used for average power measurements on multi-tone or W-CDMA signals. The sensor architecture consists of three pairs of diodes, each one configured to work in its square law region over the dynamic range of the sensor. Option 1 provides TDMA measurement capability, calibrating one of the diode pairs for linearity over a wide dynamic range.

Sensor EEPROM

All MA2400A/D Series Power Sensors through 50 GHz store calibration data and model information within internal EEPROMS. The user calibration factor tables allow extra frequency points or compensation for couplers and power attenuators.

High Power Applications

Traditional high power sensors are expensive and have degraded accuracy specifications. What's more, annual calibrations require more time and expense. Using the new User Calibration Factor Tables avoids these problems. They can easily reduce operating costs and save time:

- Any attenuator or coupler can be compensated by entering frequency and attenuation values into the internal EEPROM.
- The attenuation device can be semi-permanently attached. The power meter automatically applies compensation during the 0.0 dBm, 50 MHz calibration reference process.
- User Calibration Factor Tables are easily deactivated—allowing the power sensor to be used as a stand-alone device.
- Up to six tables can be stored.

Sensor and Power Meter Selection

Sensors	Standard Diode	Universal	Wideband	Pulse	(High Accuracy) Diode	Comments
	MA2470D Series	MA2480D Series	MA249XA Series	MA2411B	MA2440D Series	
Power Measurement	Average (RMS)	RMS	Average (RMS), Peak	Average (RMS), Peak	Average (RMS)	
Measurement Application (Examples)	CW, GMSK, GFSK, 8PSK	CW, GMSK, GFSK, 8PSK, QPSK, QAM	CW, GMSK, 8PSK, QPSK, QAM	Pulse, QAM	CW, GMSK	Modulation
	TDMA, FDMA, IS136	TDMA, FDMA, CDMA, OFDM, Radar	TDMA, FDMA, CDMA, OFDM, Radar	Radar, OFDM	TDMA, FDMA	Access Scheme
Compatible Power Meters	ML24xxA	ML24xxA	ML2480A ML2490A	ML2480A ML2490A	ML24xxA	

Choose the right sensor and meter for your measurement application.

Ordering Information

Power Meter Models

ML2495A Power Meter, Single Input
ML2496A Power Meter, Dual Input

ML2487A Power Meter, Single Input
ML2488A Power Meter, Dual Input

ML2437A Power Meter, Single Input
ML2438A Power Meter, Dual Input

ML2490A SERIES

ML2490A-06 Rear Mount Input A
ML2490A-07 Rear Input A and Reference
ML2490A-08 Rear Mount Inputs A, B and Reference
ML2490A-09 Rear Mount Inputs A and B
ML2490A-33 Extra Operating Manual
ML2490A-34 Extra Programming Manual
ML2490A-37 Electronic Manuals
(deletes paper version from shipment)
ML2490A-98 Calibration to Z540, ISO Guide 25
ML2490A-99 Premium Calibration

ML2480A SERIES

ML2480A-06 Rear Mount Input A
ML2480A-07 Rear Input A and Reference
ML2480A-08 Rear Mount Inputs A, B and Reference
ML2480A-09 Rear Mount Inputs A and B
ML2480A-15 Factory Fitted 50MHz and 1GHz Calibrator
(required by MA2411B Sensor)
ML2480A-15R Retro Fit Calibrator Kit
ML2480A-33 Extra Operating Manual ML2487/8A
ML2480A-34 Extra Programming Manual ML2487/8A
ML2480A-35 Extra Operating Manual: Japanese
ML2480A-36 Extra Programming Manual: Japanese
ML2480A-37 Electronic Manuals only
(deletes paper version from shipment)
ML2480A-98 Calibration to Z540, ISO Guide 25
ML2480A-99 Premium Calibration
ML2400A-32A Maintenance Manual ML2480/90A Series
ML2400A-31A Option 31, Extra Operation/Prog manual ML2480A

Options 1, 3, 5 are mutually exclusive for any given ML2480/90A.
Options 6, 7, 8 and 9 are mutually exclusive for any given ML2480/90A.

ML2430A SERIES

10585-00003 Maintenance Manual ML2400A Series
ML2400A-33 Extra Operating & Programming Manual ML2437/8A
MA2499B Anritsu 4700 & 4600 Series Sensor Adapter
ML2400A-06 Rear Mount Input A on ML2437A
ML2400A-07 Rear Input A and Reference on ML2437A
ML2400A-08 Rear Mount Inputs A, B and Reference
ML2400A-09 Rear Mount Inputs A and B on ML2438A
ML2400A-11 NiMH Battery with Desktop Charger
ML2400A-11A NiMH Battery with Desktop Charger
(for use in Japan only)
ML2400A-22 3m Sensor Cable
ML2400A-23 5m Sensor Cable
ML2400A-24 10m Sensor Cable
ML2400A-25 30m Sensor Cable
ML2400A-26 50m Sensor Cable
ML2400A-27 100m Sensor Cable
ML2400A-30 Extra Operation Manual ML2437/8A
ML2400A-98 Calibration to Z540, ISO Guide 25
ML2400A-99 Premium Calibration
ML2400A-30A Option 30, Extra Operation/Prog manual
(For use in Japan, only)

Options 1 to 5 above are mutually exclusive for any given ML2430A unit.
Options 6, 7, 8 and 9 above are mutually exclusive for any given ML2430A.

Pulse/modulated performance only specified with 1.5M sensor cable length option

Software upgrades, Labview drivers and application notes can be downloaded from the Anritsu web site at www.Anritsu.com

Standard Accessories

Power Cord for Destination
One 1.5m sensor cord per meter input
Operation Manual
GPIB Manual
Certificate of calibration, also included with sensors

General Options and Accessories

760-209	Hardside Transit Case
D41310	Soft Carry Case with Shoulder Strap
MA2418A	50 MHz Reference Oscillator with Power Supply
ML2400A-01	Rack Mount, single unit
ML2400A-03	Rack Mount, side by side
ML2400A-05	Front Bail Handle
ML2400A-12	Front Panel Cover
ML2400A-20	Spare 1.5m Sensor Cable
ML2400A-21	0.3m Sensor Cable
ML2400A-28	RS232 Bootload Cable
ML2400A-29	Bulkhead Adapter
ML2419A	Range Calibrator
MA2497A	Agilent/HP 84xxA Series Sensor Adaptor

Power Sensor Models

MA2470D	Standard Diode Series
MA2480D	Universal Diode Series
MA249xA	Wideband Diode Series
MA2411B	Pulse Sensor
MA2440D	High Accuracy Diode Series

See your Anritsu Representative or Components catalogue for available Attenuators, Limiters, Coaxial adapters, Waveguide-to-Coaxial adapter, Splitters & Dividers, Loads, Bridges, Open/Shorts, and Calibrated Torque wrenches.

For complete power meter and sensor specifications;
Technical Datasheet 11410-00423.



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