## POWER METERS
# ML2430A series


The ML2430A Series Power Meters combine the advantages of thermal meter accuracy, diode meter speed and peak power meter display graphics. The result is a single instrument that samples at more than 35k per second and achieves 90 dB dynamic range with a single sensor.
The ML2430A Series includes graphics display capability as a standard feature. The ruggedized housing and optional high-capacity NiMH battery bring laboratory quality accuracy to field service applications.

## Performance

- **Speed and dynamic range**

The 90 dB range MA2470A Series Power Sensors' high sensitivity reaches stable power readings to -70 dBm. 35 kHz sample rates profile cellular, PCS and other pulsed signals to 0.1 µsec resolution. Modern connector technology achieves industry leading return loss for improved accuracy through 50 GHz. The 87 dB range MA2440A Series High Accuracy Sensors further improve return loss performance by adding a matching circuit to the MA2470A Series' front end.

**New power sensor technology achieves industry leading measurement linearity and high sensitivity.**

- **Fast thermal sensors**

Anritsu's latest semiconductor processing technology produces thermal power sensors with speed increased by an order of magnitude. Improvements in connector technology reduce measurement mismatch uncertainty through 50 GHz to levels previously attained only to 20 GHz. The fabrication technique as well as the ML2430A's sampling and DSP technology optimize measuring speed to 4 ms rise and fall times.

- **GPIB speed**

Industry leading speed is achieved under a variety of operating conditions including averaging settings, sensor control settings, triggering conditions, operating mode, sensor type, and GPIB interface manufacturer. The ML2430A series offers the ability to measure and transfer a high speed burst of 200 data points using profile operating mode with sampling rates of 35k per second.

- **GPIB emulation**

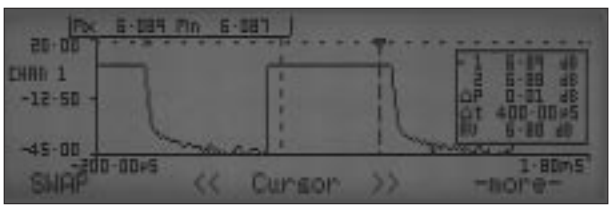
With 99.9% emulation of older meters, the ML2430A series improves ATE system productivity. Typical test system speed improvement is 2 to 10 times faster system speed depending upon the number of measurements taken during the test, the minimal use of wait statements within the code, and the meter model emulated.

- **Triggering controls**

What use is high speed without triggering and sample controls? Data acquisition event arming and triggering functions traditionally found on expensive peak power meters are standard in the ML2430A series. Triggering delay and the sample integration time per reading can be directly controlled by the operator. Trigger sources include, continuous, internal, external TTL, and manual. Thus, data acquisition can be optimally controlled for synchronization with other test equipment.

- **Burst profile graphics display**

The ML2430A features random repetitive sampling for high resolution of fast signals. A time domain graphic display profiles pulsed signals over a power range of –40 dBm to +20 dBm. 35 kHz sampling speed produces clear power profiles of cellular and PCS signals including TDMA, PHS, GSM, and DCS-1800. Pulse top power is easily and repeatably measured using between cursor averaging. Measure pulse-top power over >80 dB dynamic range in readout mode at




GPIB speeds >200 readings per second.

- **Power vs. time graphics display**

One of the most common power meter ATE program types is a plot of RF power versus some stimulus. The power versus time mode is a strip chart style display for monitoring gain and output power variations over time/temperature, supply voltage or a component tolerance. In service applications, power versus time mode speeds trouble shooting of unusual conditions such as intermittent switches or abnormal power control in a mobile telephone. The power versus time mode provides a clear strip chart display of RF power variation.

- **Parallel printer connector**

Many deskjet series printers can be connected directly to the ML2430A for fast documentation of performance on the bench or in the field. Meter calibration, triggering and averaging settings are listed with the display printout. Thus, evidence of DUT (device under test) anomalies can be duplicated quickly, allowing engineers to fix problems with minimal time investment.

**• 90 dB dynamic range**
Typical communications industry ATE systems operate over a 60 to 80 dB dynamic range. The MA2470A series' 90 dB dynamic range replaces two 50 dB sensors. Further an RF switch is no longer needed for the two sensors. This reduces software control complexity and further speeds test execution.

**• Sensor EEPROM**
All MA2400A series sensors are equipped with internal EEPROMs for storage of calibration factor data vs. frequency. This allows the power meter to interpolate and correct readings automatically, improving accuracy and convenience.

**• High reliability**
Rugged poly-carbonate chassis design handles drop shocks and rough field treatment. No vent holes are present, thus the meter is splash resistant. A front cover panel and softcase are optional for further environmental protection. Power sensors are also ruggedized for rough handling.

**• Improved accuracy**
Mismatch uncertainty is typically the largest source of error. The MA2400A series Power Sensors offer a typical 5 to 6 dB improvement in sensor return loss, typically cutting mismatch uncertainty in half. The MA2440A series High Accuracy Sensors incorporate a matching pad which further improves return loss by 5 to 6 dB - again halving mismatch uncertainty.

**• Offset table for path loss correction**
Compensating for the true frequency response of attenuators, couplers, cables, switches and other test setup devices improves measurement accuracy. For this reason, the ML2430A series can apply an offset table of attenuation-versus-frequency in addition to the traditional fixed dB offset capability. When a power sensor connection is preceded with a new 1N series wideband power limiter, the offset table compensates for frequency response. Thus, the combination achieves an accurate, "burnout-proof" sensor.

**• Softkey menu control**
Softkey menus simplify instrument control by making the user interface easier to understand. The numerical keypad simplifies the operator interface.

**• Battery**
The optional NiMH "Smart" battery supports high charge density for a typical 8 hour day of operation. Accurate fuel gauging, <2 hour fast charge cycling, and the elimination of NiCd style memory effect further enhances the convenience of this battery technology.

**• Voltmeter**
The ML2430A series also supports high speed voltage measurement. A rear panel BNC measures voltage or operates as V/GHz input supporting automated sensor calibration factor correction.

## Specifications

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| Frequency range*[1] | | 10 MHz to 110 GHz |
| Power sensors | | Meter specifications apply to MA2400A series Power Sensors. Compatible with Anritsu MA and MP series sensors. |
| Sensor dynamic range | | MA2420A series Fast Thermal Sensors: 50 dB<br>MA2440A series High Accuracy Power Sensors: 87 dB CW, 57 dB Peak<br>MA2470A series Power Sensors: 90 dB CW, 60 dB Peak |
| Power measurement range | | –70 to +47 dBm (0.1 nW to 50 W), sensor/attenuator dependent. Use couplers for higher power levels. |
| Voltage measurement range | | 0.00 to 20.00 V, nominal |
| Display range | | –99.999 to +99.999 dB |
| Display resolution | | Selectable from 0.1 dB 0.001 dB limited to 0.01 dB in graphical display modes; Linear power units, 3 to 6 digit,<br>1 - 3 digits selectable to right of decimal nW - W; Voltage, 1 - 2 digits selectable to right of decimal. |
| Offset range | | –99.999 to +99.999 dB. Fixed value or frequency dependent table. |
| Display units | | dBm, dB, dBr, dBmV, dBVr, W, %, Volts |
| Instrumentation accuracy | | <0.5% |
| Zero set and drift | | <0.5% MA2420A; <0.5% MA2470A series and MA2440A series. Percent of full scale in most sensitive range, measured over one hour with maximum averaging after one hour warm up at constant temperature. |
| Noise | | <0.5% of full scale in most sensitive range, measured over a one minute interval with maximum averaging, two standard deviations at constant temperature after one hour warm up, typical. MA2470A series, 20 pW typical. |
| 1.00 mW power reference | | Frequency: 50 MHz nominal<br>Output level: 1.00 mW, ±1.2%/year, ±0.9% RSS, NIST Traceable<br>Maximum input: +20 dBm continuous or peak, ±50 V dc<br>VSWR: <1.04<br>Connector: Type N precision female |
| Sensor/channel control | Operating modes | Readout, dual channel. RF power or voltage.<br>Power versus time: Single channel graphic of readout data over adjustable time interval. RF power or voltage<br>Profile: Single channel RF peak power graphic display for analysis of repetitive pulse or transient waveforms |
| | Range hold | Current range or selectable 1 through 5. |
| | Averaging | Auto-averaging: Moving average increases averaging at low power ranges.<br>Averaging types: Auto, Manual (Moving, Repeat)<br>Manual average range: 1, 2, 4, ..., 512<br>Low-level averaging: Low, Medium, and High settings apply post-average low pass filter to improve visibility at high display resolution settings. |
| | Limit lines | Variable high and low limits with audible, rear panel TTL output, and/or visible Pass/Fail alarm indication. Failure indication can be set to latch until cleared so that a transient failure can be easily noticed. |
| | Cursors | Two manually adjustable cursors with power, delta cursor power, between cursor power average, and delta time readout display.<br>Delta t resolution: 0.5% of display period or 100 ns |
| Triggering | Trigger sources | Internal, External TTL, GPIB, Manual, Continuous |
| | Delay range | 0.0 to 1000.0 Milliseconds |
| | Delay resolution | 0.5% of display period or 100 ns |
| | Internal trigger range | –25.0 to +20.0 dBm MA2470A series Sensors. |
| | Internal trigger level accuracy | 1.0 dB, typical |
| | External trigger range | TTL rising or falling edge trigger. BNC input |
| | Manual trigger | Front panel softkey |

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| System configuration | Display | | LCD graphic display with dual channel readout mode and dual peak meters. Backlight and adjustable contrast standard. |
| | Save/Recall | | Offset table memory: Five 200 point storage locations of power level and frequency pairs. A table can be subtracted from measurements and recalled for parallel printer output or download to controller.<br>Setup memory: 10 storage registers plus RESET default settings<br>Offset table record length: 200 points maximum. |
| | Secure mode | | Erases memory information upon power ON. Default condition is secure mode OFF. |
| | Rear panel inputs/ outputs | Cal factor voltage input (BNC) | Operating modes<br>Voltage: Display voltage reading on selected channel<br>Voltage proportional to frequency for sensor calibration factor compensation<br>Blanking input: TTL levels only. Selectable positive or negative polarity.<br>Input range: 0 to 20 V<br>Resolution: 0.5 mV<br>Control: Adjustable voltage to frequency relationship |
| | | Analog output (BNC): two outputs configurable to log or lin | Operating modes<br>Analog out: Selectable channel adjusted for calibration factors and other power reading correction settings.<br>Pass/Fail: Selectable TTL High or Low<br>Channel output: Uncalibrated, real time analog.<br>AC modulation output: Output 1 only.<br>Dwell output: Output 2 only<br>Output range: –5.0 to 5.0 V<br>Resolution: 0.1 mV |
| | | Trigger input | Operating modes: External TTL or RF Blanking. |
| | | GPIB interface | IEEE-488.2 and IEC-625<br>Implements: AH1, SH1, T6, LE0, SR1, RL1, PP0, DC1, DT1, C0 and E1 |
| | | RS-232 | Supports software download and remote monitoring. |
| | | Parallel printer output | Compatible with Deskjet 540 and 310 models. Other 500 series and 300 series and later are typically compatible.<br>See manual for DIP switch settings. |
| General specifications | General | | MIL-T28800E, Type 3, class 5, Style E |
| | Display | | Flat panel monochrome LCD graphic with backlight |
| | Operating temperature range | | 0.0 to +50°C. |
| | Storage temperature range | | –40 to +95˚C |
| | Moisture | | Splash and rain resistant, 95% humidity non-condensing. |
| | Power requirements | | AC: 90 to 250 Vac, 47 to 440 Hz, 40 VA maximum<br>DC: 12 to 24 Vdc, Reverse protected to –40. Maximum input 30 V.<br>Battery: >6 hr usable with 3000 mAhr battery |
| | Replaceable battery (Option) | | 3000 mAhr NI-Mh (DR-36 series) |
| | EMI | | Complies with EN 55011 GRP1: 1991 CLASS A; 50082-1: 1992 |
| | Warranty | | 1 year, additional available |
| | Dimensions | | 8.39 inches (213 mm) wide, 3.46 inches (88 mm) high, 9.84 inches (250 mm) deep |
| | Mass | | <6.6 lbs (<3 kg) |
| Accessories furnished | | | Operation and programming manual<br>Sensor cable 1.5 m: One per input<br>Power cord mains plug matches destination requirements. |

⁎1: Sensor dependent