

M2000 Series

Precision Multi-Channel Power Analyzers

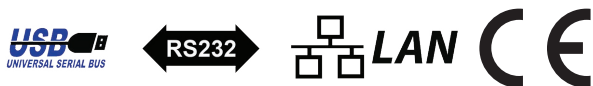
1000 Vrms / ± 1750 Vpeak



M2000 Series: Multi-Channel AC & DC Power Analyzer with Four Card Slot Main-Frame

The M2000 Series Precision Power Analyzer supports a 0.03% base accuracy for class leading measurement accuracy. The M2000 main-frame offers four slots that accept either internal shunt V+I channel cards (AD Type) or external shunt or CT V+V channel cards (AX Type).

Any combination of cards can be used up to four total per chassis. For single phase applications, pro-configured standard single card models M2001D, M2001H or M2001X are available. For three phase power applications, the M2003D, M2003H or M2003X offer three channels.



Key Features

- Four Card Slot Mainframe
- 1000 Vrms / ± 1750 Vpeak
- Internal 20Arms Shunt (AD Card)
- Internal 30Arms Shunt (AH Card)
- External Shunts or CTs (AX Card)
- 0.03% Base Accuracy Performance
- Affordable Accuracy, Bandwidth and Ease of Use
- Large Color Touch Screen Operation
- Multi-Channel Configurations
- Internal Shunt or External Current Transducer Channel Cards
- Extensive Measurement Functions to 1.25MHz:
 - Vac, Vdc, Vrms, Vac+dc, Iac, Idc, Irms, Iac+dc
 - Watts, VA, VAR, PF, CF
 - Voltage & Current Harmonics, Vthd, Ithd
- Multiple Virtual Power Analyzer Configurations
- Numeric and Graphical Displays
- Energy Star / IEC62301 Compliant Standby Power Measurement mode
- Ultra-quiet Fanless Operation
- Bench Use or 4U Height 19" Rack Mount

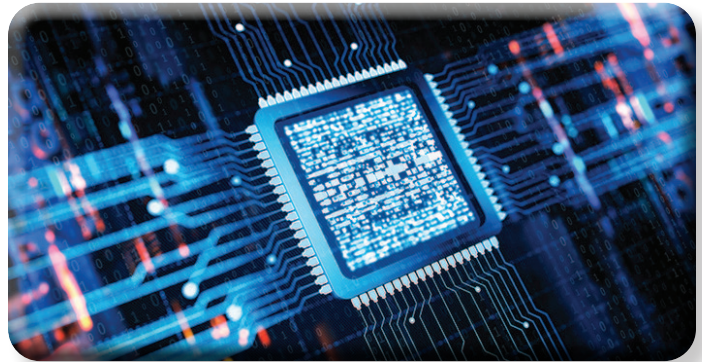
Advantages:

- Each card has separate, fully synchronized, 24-bit high-speed data acquisition hardware that conditions and captures voltage and current input signals and processes data into a broad range of measurements.
- Despite its extensive features, the M2000 is easy to use and offers versatile, high-resolution color displays for clear data visualization.
- The M2001 handles single-phase applications, while M2003 models support Delta and Wye configurations for multi-phase voltage, current, and power measurements.

INDUSTRY LEADING DATA ACQUISITION TECHNOLOGY

The M2000 is an advanced power analyzer using cutting-edge data acquisition technology to accomplish unmatched accuracy at a greatly reduced cost.

- Sampling Rate:** Real-time 245Ksps digital sampling rate is extended to an effective 384Msps sampling rate for periodic signal using a combination of deliberate signal jittering and repetitive sampling.
- Resolution:** 24 bits dual ADCs per channel
- Meas. Gap:** No inter-measurement gaps for 100% signal coverage of all non-harmonic measurements
- Synchronization:** Input signal synchronization to within $< \pm 5\text{ppm}$ of an integer number of fundamental cycles
- Sampling Jitter:** Sampling is deliberately jittered such that the relative time of any given sample in a measurement period varies by up to $\pm \frac{1}{2}$ a sample period but the net effect is zero when averaged over the entire measurement period. The jitter

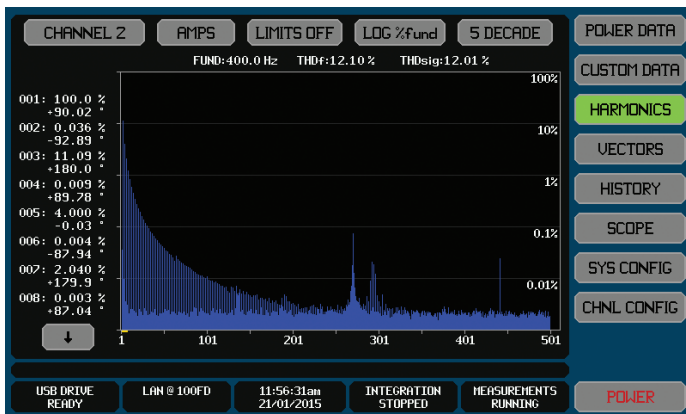


is quasi-random such that there are no sub-measurement period periodic elements within the actual sampling rate.

Phase Accuracy: The V and A inputs of each channel are sampled to ensure that the signals at the terminals are sampled nominally within $< \pm 5\text{ns}$ of each other (equivalent of $\pm 0.0018^\circ$ per kHz phase)

Inter-Channel Diff: All channels are sampled to ensure that all available input signals are sampled nominally within $< \pm 20\text{ns}$ of each other (equivalent of $\pm 0.0072^\circ$ per

HARMONIC ANALYSIS



Current Harmonics Bar Chart Display

Harmonic analysis is performed on each configured input channel, with up to 8 total inputs and no limit on the number of channels analyzed. Each channel supports analysis of up to 500 harmonics.

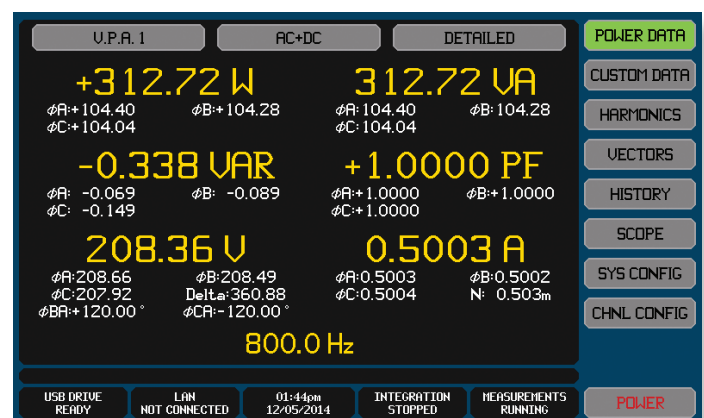
Voltage and current samples are processed using DFT with 48-bit precision and 64-bit accumulation. The DFT uses modified sine/cosine tables to compensate for jittered sampling.

Samples are sub-sampled and anti-alias filtered as needed. All harmonics across all inputs and channels in a Virtual Power Analyzer are analyzed simultaneously to ensure consistent multi-channel results.

POWER MEASUREMENTS

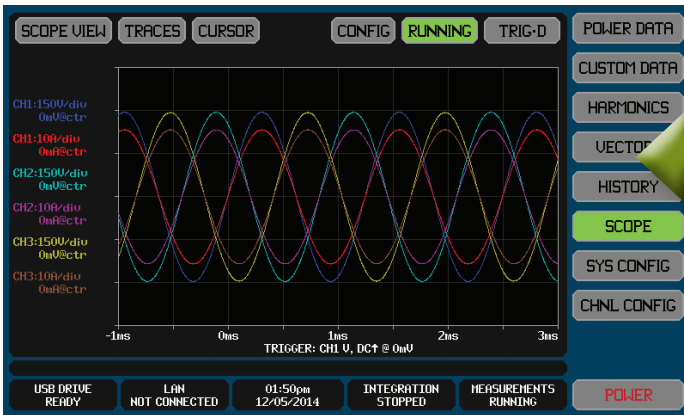
The power data screen is accessible with a single touch and displays FFUND, V, A, W, VA, VAR, and PF for any selected channel or group—up to three groups in a single M2000 unit.

It also shows peak values, phase, CF, and integrated data like WHr. Users can create custom data screens in a spreadsheet and upload them via interface or USB drive.



Power Measurement Data Display

POWERFUL INFORMATION DISPLAYS IN FULL COLOR



SCOPE VIEW MODE

The scope view displays time-domain data similar to a digital storage oscilloscope, showing up to six signals with individual vertical scaling, offset, and color.

Users can set timebase, trigger level, and trigger offset. The M2000 power analyzer offers significantly higher amplitude accuracy than typical digital scopes, revealing details standard scopes may miss.

CYCLE VIEW MODE

The cycle view display shows a single cycle of voltage and current waveforms, jitter-sampled over multiple cycles to provide time resolution down to 1/512th cycle (2.6 ns). Users can view volts, amps, watts, and inter-phase voltages for any channel, with up to six traces, each with independent vertical scaling and offsets.

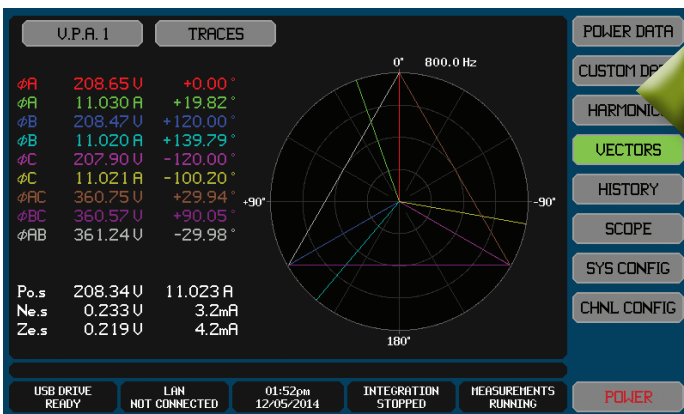
This mode is ideal for inspecting periodic waveforms with high amplitude and time detail.



VECTOR VIEW MODE

The polar chart displays fundamental voltage and current vectors for the selected channel or group. In multi-phase groups, it also shows inter-phase voltages and non-measured neutral vectors.

Up to 10 vectors can be enabled, each with user-selectable colors.

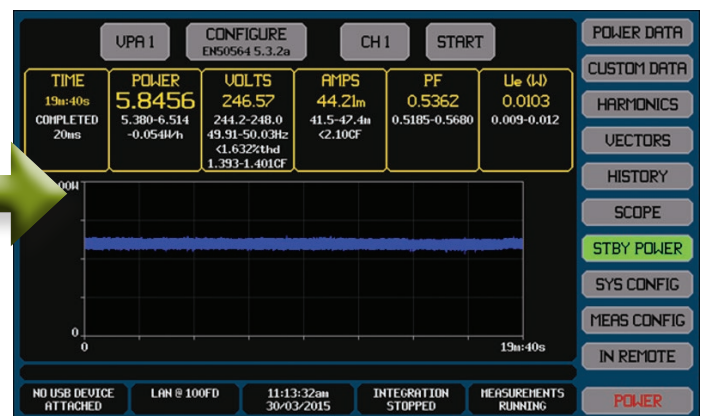


STANDBY POWER VIEW MODE

The M2000 includes built-in standby power testing per EN50564:2011 (replacing IEC62301), initiated via the STBY POWER touch key.

All data is shown on a single screen for easy viewing and can be saved as an image to a USB drive.

Users can select measurement methods, minimum test time, and data logging options per EN50564:2011. Multiple standby power tests can be run independently on each configured channel.



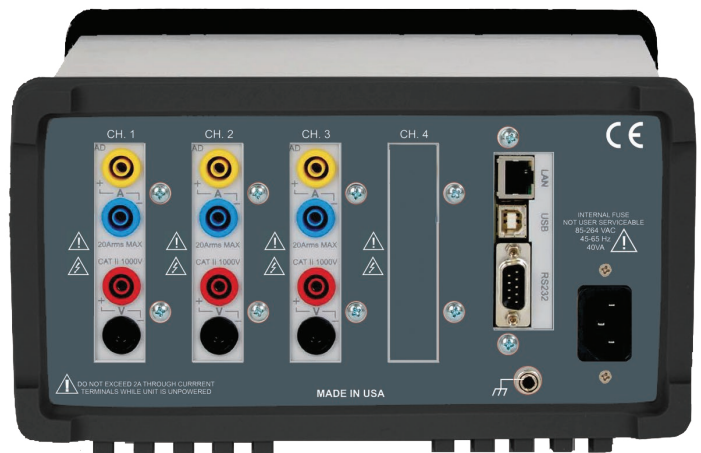
CONVENIENT TOUCH SCREEN OPERATION

The M2000 is operated entirely via its large touch-sensitive display, with no buttons or dials to disrupt the data view.

All signal connections are made at the rear using color-coded safety banana jacks; matching alligator clip lead sets are included.



M2003 Chassis - Front Panel



M2003 Chassis - Rear Panel

CHANNEL CARD TYPES - AD, AH & AX

The M2000 Mainframe supports one to four channel cards, each with dual safety-style inputs for voltage and current. Two card types are available:

- AD/AH cards use internal shunts for current measurements up to 20 Arms/150 Apk (AD) or 30 Arms/200 Apk (AH).
- AX cards use external shunts or transducers for broader current ranges. Devices with current output (e.g., CTs or Hall Effect sensors) require a burden resistor, as the AX card measures voltage.
- Cards can be mixed in a single M2000 Mainframe, and both types meet the same base accuracy spec.



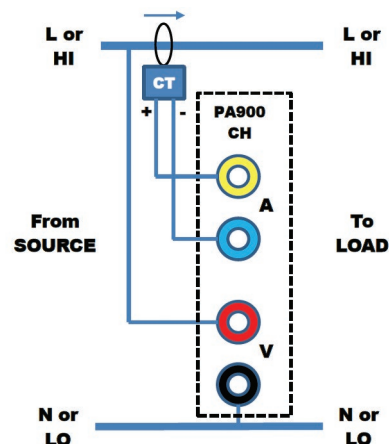
AD or AH Type Card (Left), AX Type Card

Note: AX cards do not include shunts, transformers, or transducers.

AX CARDS - EXTERNAL SHUNTS OR CURRENT TRANSDUCTORS

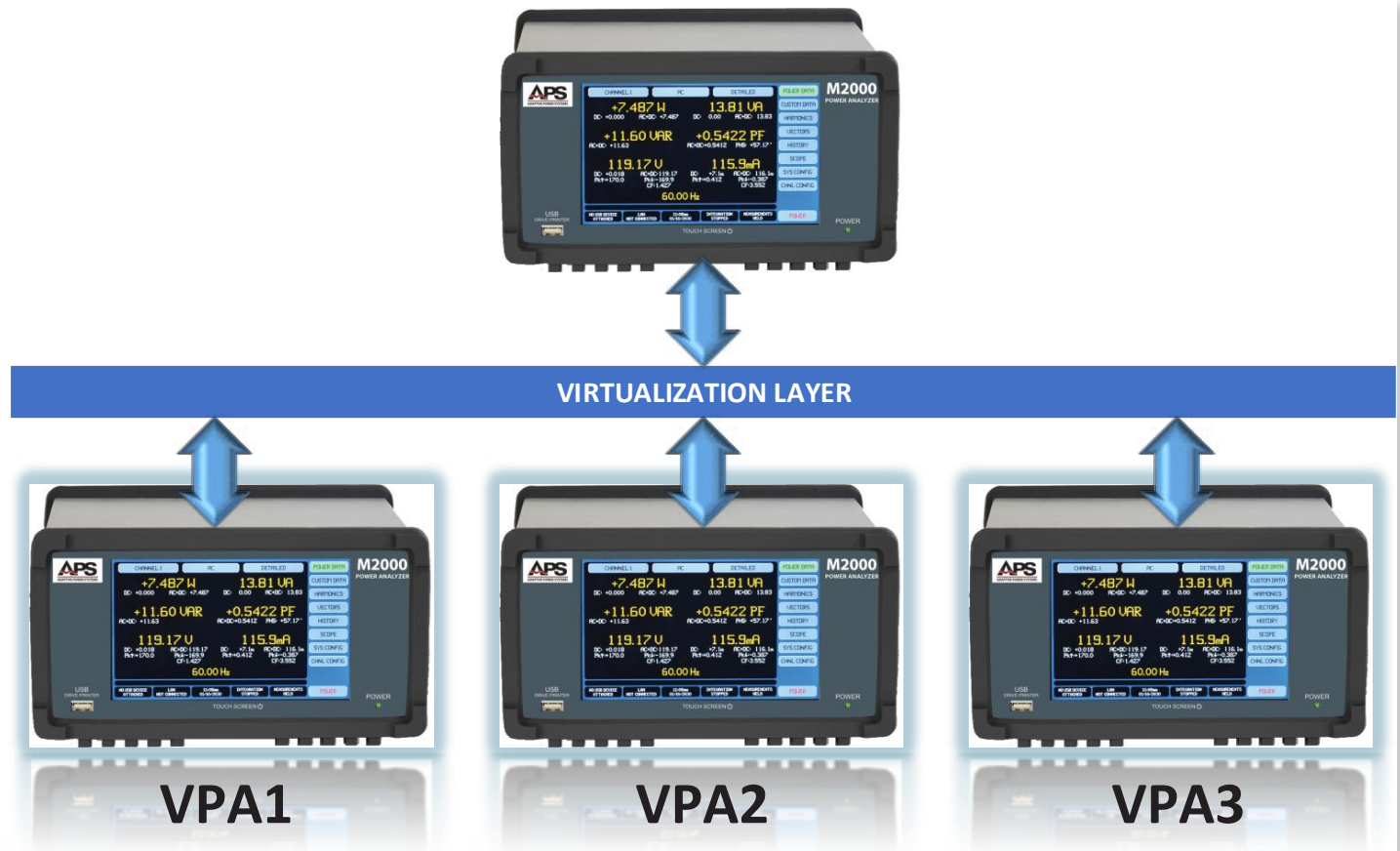
The external current shunt or current transducer input on AX Type cards will accept an input voltage up to 15Vrms / 20Vpk on the HI range.

- Depending on the V:A transducer used, a suitable burden resistor must be used to scale the voltage within this range.
- The V/A scaling can be configured on the power analyzer so current results are correctly displayed.
- When using an external current shunt, the LO range generally is the best choice.



AX Type Card using external CT

VIRTUAL POWER ANALYZER CONFIGURATIONS



Virtualization - Multiple Analyzers in One

The M2000 Series supports up to three Virtual Power Analyzers (VPAs) per mainframe, all accessed through a single user interface.

Channels can be assigned to any—or none—of the three VPAs, with each VPA configurable to include one or all installed channels.

Each VPA is independently set up for wiring configuration, signal filtering, measurement coupling, result smoothing, significant digits, VA/VAR combination method, and efficiency grouping.

Virtual Power Analyzer Wiring

Each VPA can be configured for the following multi-channel wiring configurations subject to the number of channels assigned to it:

- General (1 to 4 channels)
- 2Ø3w (2 channels)
- 3Ø3w (2 channels)
- 3Ø3w (3 channels)
- 3Ø4w (3 channels)

Each virtual power analyzer may be configured as having one of the following synchronizations to the other virtual power analyzers:

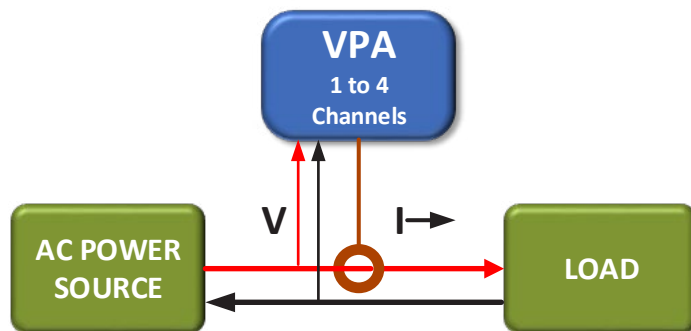
- Totally asynchronous to the other virtual power analyzers in all aspects.
- Fully synchronous to another virtual power analyzer (identical sampling, measurement period and fundamental frequency).
- Totally asynchronous to the other virtual power analyzers but using the fundamental frequency established in another virtual power analyzer.

VIRTUAL POWER ANALYZER APPLICATION EXAMPLES

Virtualization Application Examples

Several application examples of using VPAs are shown for either one, two or three VPAs.

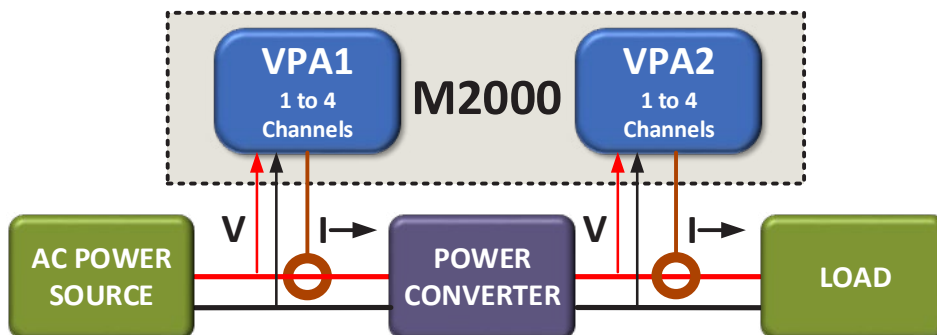
SINGLE VPA APPLICATIONS



1 ϕ 2W, 2 ϕ 3W, 3 ϕ 3W or 3 ϕ 4W

- Single phase, split phase and three phase AC products
- DC Power Supplies

DUAL VPA APPLICATIONS

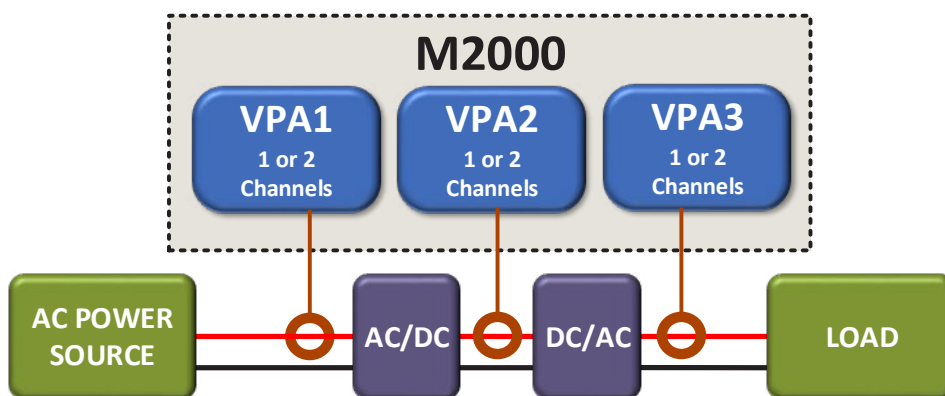


1 ϕ 2W, 2 ϕ 3W, 3 ϕ 3W or 3 ϕ 4W

1 ϕ 2W

- AC to DC Power Supplies (single or multiple outputs)
- DC to DC Power Supplies (single or multiple outputs)
- Power Transformers (single or multi-phase)
- Lighting Ballasts (most types)
- Photovoltaic Power Generators (DC in; DC or AC out)

TRIPLE VPA APPLICATIONS



1 ϕ 2W, 2 ϕ 3W

1 ϕ 2W, 2 ϕ 3W

1 ϕ 2W, 2 ϕ 3W

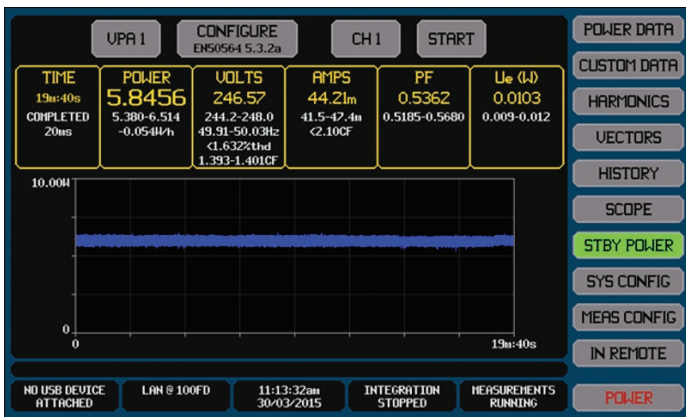
- Emergency Lighting Ballasts (most types)
- Standby or Backup Power Supplies (AC or DC)

MAINS POWER APPLICATIONS

The vast majority of power measurements are made on commercial or industrial products that are powered from the Mains (Utility power). Since grid voltage and frequencies vary around the world and, even more importantly, power quality in some parts of the world can be problematic, testing products for world-wide power conditions is an important part of any quality control program.

The M2000 provides a wide range of functions and features to do just that and does so at a very economical cost, without sacrificing accuracy.

EN50564 Standby Power Test



EN50564 Standby Power Measurement

The EN 60564 International Standard covers Electrical and electronic household and office equipment - Measurement of low power consumption. It is similar to the IEC 62301, "Household electrical appliances - Measurement of standby power" standard and specifies how to measure standby power. This test requires a very low current range such as the 1 mA measurement range of the AD Channel card.

Measurement Challenges

Standby power measurements can be challenging beyond requiring a very low current measurement range. Specifically, the following typical standby mode conditions present additional challenges for the power analyzer:

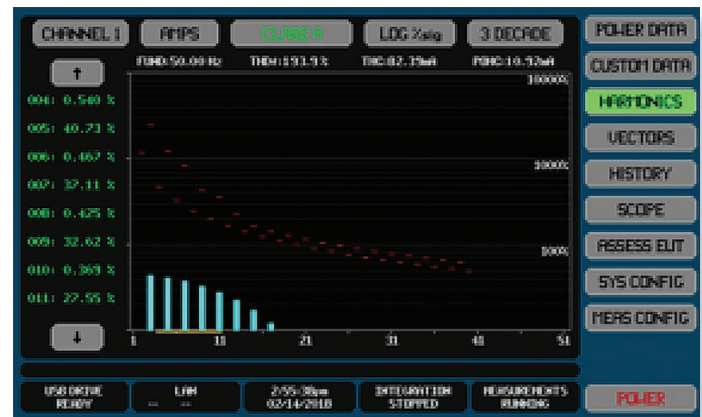
- Low power and current levels.
- Highly distorted current waveforms since power supplies operating at low load often draw very high crest-factor current.
- A low power factor because the current may be predominantly capacitive, through the power supply input's EMI filter.
- When a power supply is in burst mode, drawing power irregularly rather than continuously.

The M2000 has ample capability to meet these challenges as well as a dedicated Standby Power EN50564 test screen.

Any of the three available VPAs can be configured for single phase, split and/or three phase grid configurations. Selecting the MAINS frequency range configures all other relevant power analyzer settings for optimal performance on 50Hz to 60Hz voltage and current signals.

For use in ATE environments as part of functional test systems, the M2000 offers standard digital interfaces and available LabView instrument drivers for easy integration into any test stand.

EN61000-3-2 & -3-12 Harmonics Emissions



Products destined for Europe must meet Harmonics emissions limits as determined by harmonized standards IEC 61000-3-2 and IEC 61000-3-12. The M2000 can be used to check products during development for compliance so formal CE approval can be obtained more easily and less costly than finding problems later in the product development cycle. The M2000 offers special IEC test modes with settings and EUT class A, B, C and D harmonics limits to support these harmonics emissions measurements.



Home Appliance Test

AVIONICS & DEFENSE POWER APPLICATIONS

The high bandwidth and accuracy of the M2000 Series supports a wide range of defense and avionics measurement applications for 400Hz fixed frequency or 360Hz to 800Hz wild frequency electrical equipment. Special measurement modes are provided for common avionics power compliance test standards such as RTCA DO-160, Section 16 or Boeing

787B3-0147.

Other standard M2000 functions like harmonics measurements, spectrum measurements, ripple measurements and distortion measurements can all be used during development, testing and certification of on-board electrical AC or DC equipment.

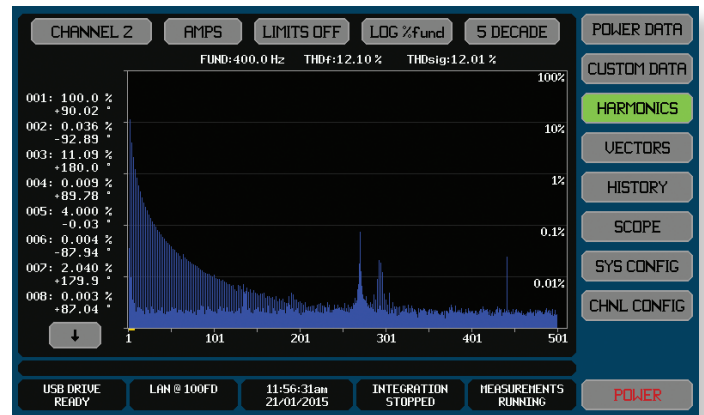
MIL-STD 704 MEASUREMENTS



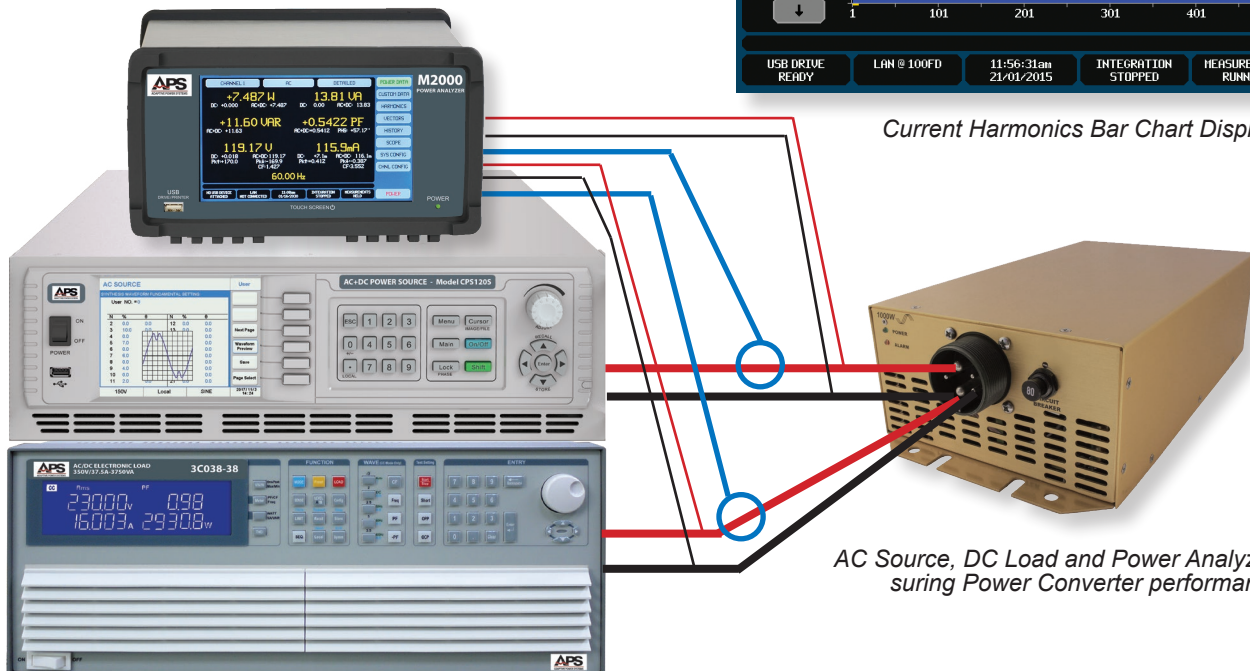
RTCA DO-160 & BOEING 787B3 MEASURE-



The M2000 is a perfect addition to any avionics power compliance test system utilizing a programmable AC power source for 400Hz or higher military AC power equipment certification. Its ability to measure up to 100 harmonics, even with a 400Hz or 800Hz fundamental power frequency, easily outperforms any programmable AC power source's measurement system.



Current Harmonics Bar Chart Display



AC Source, DC Load and Power Analyzer Measuring Power Converter performance

TECHNICAL SPECIFICATIONS

Accuracy Specification Conditions

Accuracy specifications apply following a 10 minute warm-up period after turning power on in the unit. Accuracy specifications are valid for ambient tem-

peratures $\pm 5^{\circ}\text{C}$ from calibration temperature. Add 0.005% reading/ $^{\circ}\text{C}$ outside of $\pm 5^{\circ}\text{C}$ from the calibration temperature. Accuracy specifications are valid for a period of two years after calibration in normal

PARAMETER	DESCRIPTION
GENERAL SYSTEM	
Display	7" TFT, 800 x 480 18 bpp Color LCD with high resolution pressure sensing touch
External Storage	Front panel USB Host
Sampling Rates	See Signal Sampling Specifications
Remote Control Interfaces	USB, RS232, LAN
No. of Channels	Up to four in any combination of AD and AX Cards

PARAMETER	DESCRIPTION
AVAILABLE MEASUREMENTS	
DC	Volts, Amps, Watts
AC (RMS)	Volts, Amps, Watts, VA, VAR, Power Factor, Effective Phase
AC+DC (RMS)	Volts, Amps, Watts, VA, VAR, Power Factor, Effective Phase
AC+DC (Rectified)	Volts, Amps
AC+DC (peak)	Volts (peak, high-pk and low-pk), Amps (peak, high-pk and low-pk)
AC+DC Crest Factor	Volts, Amps
AC+DC Form Factor	Volts, Amps
Inter-phase	Volts
Neutral	Amps
Load	Impedance (DC, AC and AC+DC), AC series resistance and inductance, AC parallel resistance and capacitance

PARAMETER	TYPE	RANGE
VOLTAGE INPUT RANGES		
Specified Input Range	DC	< 1000 Vdc
	AC	< 1000 Vrms
	Peak	< 1750 Vpk
No Damage Input Range	< 1 ms	3000 Vrms
	< 100 ms	2000 Vrms
	< 5 secs	1500 Vrms
	Continuous	1000 Vrms
Measurable Voltage	< 1830 Vrms and Vpk	
Impedance Burden	1.201 M Ω \pm 0.25 %	
Bandwidth (-3dB)	900 kHz Typical	

PARAMETER	CONDITION	AD CARD / AH CARD		AX CARD	
CURRENT INPUT RANGES		HI Range		LO Range	
Measurable Current Range		< 150 Arms / Apk		< 1.02 Arms / Apk	
Specified Current Range	AD: AH:	< 20 Arms / < 140 Apk < 30 Arms / < 200 Apk		< 1 Arms / Apk	
No Damage Input Range	< 8 ms	< 150 Arms / < 250 Apk		< 60 Arms / < 150Apk	
	< 40 ms	< 50 Arms		< 40 Arms	
	< 1 secs	< 30 Arms		< 5 Arms	
	Continuous	< 20 Arms		< 2 Arms	
	Power OFF	< 2 Arms / < 150 Apk		< 25 Vrms / Vpk	
Impedance		4 m Ω to 12 m Ω		0.562 Ω \pm 0.75%	
Bandwidth (-3dB)		1.25 MHz		1.25 MHz	

PARAMETER	DESCRIPTION	
VOLTAGE MEASUREMENT PRIMARY ACCURACY		
Maximum Scaling Errors		
Overall Accuracy	Add relevant errors from the table below for the maximum error in primary voltage measurements (e.g. DC, AC, AC+DC, Rectified, Peak, Valley, Peak-Valley).	
Resolution	0.1 mV	
Base Accuracy	0.03 % Rdg	
Frequency Dependent	0.01Hz - 1Hz	0.01 % Rdg
	400Hz	0.005% Rdg
	< 10kHz	F *0.005% Rdg
	10Hz - 40kHz	0.05%+(F -10)*0.012% Rdg
	40Hz - 100kHz	0.41%+(F -40)*0.025% Rdg
	100kHz - 1Mhz	(FkHz)/1000) ² * 100%
Self Heating	Only significant at higher voltages	0.05% * (VAC+DC/1000) ²
Temperature		0.005% per °C outside of ±5°C from cal. temp.
Bandwidth Limit	Applies to USER BW setting only	10% * (F / FBW) ² (unspecified for F > 0.3 * FBW)
Maximum Floor Errors		
Base Floor Error	450 μV Apply to all results as shown below in Volts (generally only significant at low input levels)	
DC Floor Error	1 mV	
AC Floor Error	MAINS, <10kHz	100 μV/ Vrdg
	400Hz, <50kHz	300 μV/ Vrdg
	Otherwise	1.1 mV/Vrdg
AC Peak Error	MAINS, <10kHz	40 mV
	400Hz, <50kHz	75 mV
	Otherwise	125 mV
Common Mode Err	1 μV per V x Hz	
Adjacent Chn Err	300 nV per V x Hz	

PARAMETER	CONDITION	AD CARD / AH CARD		AX CARD	
CURRENT MEASUREMENT	PRIMARY ACCURACY	HI Range	LO Range	HI Range	LO Range
Maximum Scaling Errors					
	Add relevant errors from the table below for the maximum error in primary current measurements (e.g. DC, AC, AC+DC, Rectified, Peak, Valley, Peak-Valley).				
Base Scaling Error		0.03 % Rdg			
Frequency Dependent Scaling Error	LF, VLF	0.01% Rdg			
	400Hz	0.002% Rdg			
	< 10kHz	F * 0.003% Rdg			
	10k-40kHz	0.03% + (F - 10) * 0.007% Rdg			
	40k-100kHz	0.24% + (F - 40) * 0.02%			
	100k-1Mhz	(F/1250)² * 100%			
	> 1Mhz	0.24% + (F-100) * 0.012% (Typical)		0.3% + (F - 100) * 0.015% (Typical)	
Self-Heating Scaling Error		0.0002% * AAC+DC²	None		
Temperature Scaling Error		0.005% per C outside of ±5° C from calibration temperature			
Maximum Floor Errors					
	Apply to all results as shown below in Amps (generally only significant at low input levels)				
Base Floor Error		38 µA	250 nA	6 µV	150 nV
DC Floor Error		0.15 mA	1 µA	40 µV	5 µV
AC Floor Error	MAINS, LF, VLF, <10kHz	1.5 µA / A Rdg	90 pA / A Rdg	35 nV / V Rdg	20 pV / V Rdg
	400Hz, <50kHz	15 µA / A Rdg	0.9 nA / A Rdg	350 nV / V Rdg	200 pV / V Rdg
	Otherwise	150 µA / A Rdg	9 0A / A Rdg	3.5 µV / V Rdg	2 nV / V Rdg
Peak Floor Error	MAINS, LF, VLF, <10kHz	5 mA / A Rdg	40 µA / A Rdg	0.75 mV / V Rdg	25 µV / V Rdg
	400Hz, <50kHz	17 mA / A Rdg	125 µA / A Rdg	2.5 mV / V Rdg	65 µV / V Rdg
	Otherwise	50 mA / A Rdg	400 µA / A Rdg	7.5 mV / V Rdg	200 µV / V Rdg
Common Mode Error		400pA per V*Hz	20pA per V*Hz	15nV per V*Hz	0.5nV per V*Hz
Adjacent Channel Error		120pA per V*Hz	7pA per V*Hz	7nV per V*Hz	0.2nV per V*Hz

PARAMETER	CONDITION	AD CARD / AH CARD		AX CARD	
WATT, VAR & VA MEASUREMENT ACCURACY		HI Range	LO Range	HI Range	LO Range
Maximum Scaling Errors					
	Apply to all results as shown below as a percentage of the reading If signal contains significant levels at multiple frequencies, apply to each level & frequency				
Base Scaling Error		0.045 % Rdg			
Frequency Dependent Scaling Error	LF, VLF	0.01% Rdg			
	400Hz	0.005% Rdg			
	< 10kHz	F * 0.006% Rdg			
	10k-40kHz	0.06% + (F - 10) * 0.014% Rdg			
	40k-100kHz	0.48% + (F - 40) * 0.032%			
	100k-1Mhz	(F/1100) ² * 150% (Typical)			
	> 1Mhz	(F/5000) * 150% (Typical)		(F/3000) * 150% (Typical)	
Self-Heating Scaling Error		Add Voltage and Current Self-Heating Errors			
Temperature Scaling Error		0.005% per C outside of ±5° C from calibration temperature			
BW Limit Scaling Error		20% * (F / FBW) ² , unspecified above 0.3 * FBW			
Maximum Floor Errors					
	Apply to all results as shown below in Watts, VA or VAR as applicable (generally only significant at low input levels)				
Base Floor Error		(VAC+DC * 38µA) + (AAC+DC * 450µV)	(VAC+DC * 250nA) + (AAC+DC * 450µV)	(VAC+DC * 6µA) + (AAC+DC * 450µV)	(VAC+DC * 0.15µA) + (AAC+DC * 450µV)
DC Floor Error	DC	(VDC * Current DC Floor Error) + (ADC * Voltage DC Floor Error) + (Current DC Floor Error * Voltage DC Floor Error)			
AC Floor Error	VA, VAR	(VAC * Current AC Floor Error) + (AAC * Voltage AC Floor Error)			
Common Mode Error	VA, VAR	(VAC * Current Common Mode Error) + (AAC * Voltage Common Mode Error)			
	Watts	(AAC * Voltage Common Mode Error)			
Adjacent Channel Error		(VAC * Current Adjacent Channel Error) + (AAC * Voltage Adjacent Channel Error)			
Phase Floor Error	VAR	VAFUND * (1 - PFFUND - cos(cos ⁻¹ (1-PFFUND) + 0.015° * F))			
	Watts	VAFUND * (PFFUND - cos(cos ⁻¹ (PFFUND) + 0.015° * F))			

PARAMETER	CONDITION	AD CARD / AH CARD		AX CARD	
HARMONIC WATT MEASUREMENT ACCURACY		HI Range	LO Range	HI Range	LO Range

PARAMETER	CONDITION	AD CARD / AH CARD		AX CARD	
POWER FACTOR (PF) MEASUREMENT ACCURACY		HI Range	LO Range	HI Range	LO Range
Add relevant errors from the table below for the maximum error in PF measurements. For PFFUND apply only the Base Floor and Phase Errors. Applies to AC, AC+DC and FUND PF results					
Base Floor Error	Applies to all PF results	$(38\mu\text{A} / \text{AAC} + \text{DC}) + (450\mu\text{V} / \text{VAC} + \text{DC})$	$(250\text{nA} / \text{AAC} + \text{DC}) + (450\mu\text{V} / \text{VAC} + \text{DC})$	$(6\mu\text{A} / \text{AAC} + \text{DC}) + (450\mu\text{V} / \text{VAC} + \text{DC})$	$(0.15\mu\text{A} / \text{AAC} + \text{DC}) + (450\mu\text{V} / \text{VAC} + \text{DC})$
AC Floor Error		$-\text{PF Rdg} * ((\text{Current AC Floor Error} / \text{A Rdg}) + (\text{Voltage AC Floor Error} / \text{V Rdg}))$			
DC Floor Error	Applies to AC+DC PF result after multiplying by (1-PF)	$(150\mu\text{A} / \text{AAC} + \text{DC}) + (1\text{mV} / \text{VAC} + \text{DC})$	$(1\mu\text{A} / \text{AAC} + \text{DC}) + (1\text{mV} / \text{VAC} + \text{DC})$	$(40\mu\text{A} / \text{AAC} + \text{DC}) + (1\text{mV} / \text{VAC} + \text{DC})$	$(5\mu\text{A} / \text{AAC} + \text{DC}) + (1\text{mV} / \text{VAC} + \text{DC})$
Phase Error	Applies to all PF results	$(\text{PFFUND} - \cos(\cos^{-1}(\text{PFFUND}) \pm 0.015^\circ * \text{F}))$ Alternately, as a worst case (at PF=0) this can expressed as $\text{F} * 0.00028$			

PARAMETER	DESCRIPTION	
FREQUENCY MEASUREMENTS		
Ranges	MAINS	45 Hz to 65 Hz
	AVIONICS	300 Hz to 900 Hz
	VLF	0.0099 Hz - 65 Hz
	LF	0.19 Hz - 1000 Hz
	All other	9 Hz - 80 kHz
Min. DC Input Level (Typ.)	Voltage	0.5Vrms
	Current AD	HI : 0.04 Arms LO: 0.3 mArms
	Current AX	HI: 5 mVrms LO: 150 μVrms
Min. Pulse Width (Typ.)	5 μsec, 0.001% of Meas Period, 10% of Signal Period	
Resolution (Nominal)	0.0005% / Update period	
Max. Error	0.01% + Resolution	

PARAMETER	DESCRIPTION
AC MAINS INPUT	
AC Input Voltage	85 ~ 264Vac $\pm 10\%$, 1 Phase
Input Frequency	50Hz ~ 60Hz $\pm 5\text{Hz}$
Power Consumption	40 VA max.
Installation Category	CAT II
Measurement Categories	EN61010-1 CAT I 1000V; EN61010-1 CAT II 1000V; CAT III 600V; CAT 300V
Environment	Pollution Degree 2
Operating Temperature	0° C ~ +40°C / +32°F ~ +104°F
Storage Temperature	-20° C ~ +75°C / -4°F ~ +167°F
Max. Relative Humidity	< 85% RH, non-condensing
Max. Operating Altitude	2000 meters / 6562 feet ASL

PARAMETER	DESCRIPTION
REMOTE CONTROL INTERFACES	
-USB	USB 2.0 Serial Interface
Connector	USB Type-B, Rear Panel
-LAN	Ethernet 10BaseT / 100BaseTX
Connector	RJ45 , Rear Panel
Protocols	ICMPv4, ARP, UDP/IPv4, TCP/IPv4, DCHPv4, mDNS, IGMPv3
Port	10733
-RS232	RS232 Serial Interface
Connector	DB9 Male , Rear Panel
Baud Rates	9600, 19200, 57600, 115200 bps
Formats	Data, Parity, Stop Bits: 8,N,1

PARAMETER	DESCRIPTION
DIMENSIONS & WEIGHT	
Size (H x W x D)	137 x 248 x 284mm
(Height with feet not extended)	5.4" x 9.75" x 11.2"
Shipping Size	229 x 356 x 356
	9" x 14" x 14"
Net Weight	3.2 Kg / 7.0 lbs

ORDERING INFORMATION

Standard Models

Select standard pre-configured M2000 Power Analyzer model from table below. Custom configurations available with potentially longer delivery times. M2000 Mainframe can hold from one through max. four channel cards of different types as needed. Card may be added at a later time on existing units through customer service.

MODEL	DESCRIPTION	NO CHAN- NELS	CARD TYPE
M2000	Digital Power Analyzer Mainframe Only	None	N/A
M2001D	Digital Power Analyzer, Single Channel, AD Card - Internal 20A Shunt	1	AD
M2001H	Digital Power Analyzer, Single Channel, AH Card - Internal 30A Shunt	1	AH
M2001X	Digital Power Analyzer, Single Channel, AX Card - External Transducer	1	AX
M2003D	Digital Power Analyzer, Three Channels, AD Cards - Internal 20A Shunts	3	AD
M2003H	Digital Power Analyzer, Three Channels, AH Cards - Internal 30A Shunts	3	AH
M2003X	Digital Power Analyzer, Three Channels, AX Cards - External Transducers	3	AX
Other	Contact Factory for other channel configurations	Max. = 4	AD, AH and/or AX

Measurement Card Types

CARD TYPE	DESCRIPTION	NO CHANNELS
AD	AD Type Channel Card with Dual Current Shunt Input. Includes 4 color coded, heavy duty 1.5 meter test leads and a NIST cal cert (no data). Max. Current 20 Arms.	2 - Voltage, Current
AH	AH Type Channel Card with Dual Current Shunt Input. Includes 4 color coded, heavy duty 1.5 meter test leads and a NIST cal cert (no data). Max. Current 30 Arms.	2 - Voltage, Current
AX	AX Type Channel Card with External Current Transducer Input. Includes 4 color coded, heavy duty 1.5 meter test leads and a NIST cal cert (no data).	2 - Voltage, Current Transducer Voltage

MODEL	DESCRIPTION
M2000-RMK	19" Rack mount kit for one M2000 Chassis, 4U / 7" Rack height

Accessories



Color Coded Alligator Lead Set per Card



US AC Line Cord



M2000-RMK Rack Mount Kit

WORLDWIDE SERVICE AND SUPPORT

Adaptive Power Systems' customer support is second to none. Our Customer Support Program provides the training, repair, calibration, and technical support services that our customers value. Customers can rely on us for excellent support before, during and after the sale with support and service centers around the world.

New Product Warranty: 2 years

Complete calibration and repair services are offered at our US, European and Chinese manufacturing facilities. Calibrations are to original factory specifications and are traceable to NIST (National Institute of Standards and Technology).

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