Valhalla Scientific, Inc.
Model 2330A Power Analyzer Specifications

1-1.Voltage Specifications

The accuracy figures given below are valid following a 1 hour warm-up period at the calibration temperature ±5°C. Figures are valid for a period of one year from the date of calibration.

1-1-1.Voltage Ranges and Resolutions

Ranges:	50V	150V	300V	600V
Resolution:	<User-selectable at 4, 5 or 6 digits>			

1-1-2. Voltage Accuracy and Bandwidth

True RMS, DC coupled (AC+DC):

DC:	±0.2% of reading ±0.2% of range
30Hz to 5kHz:	±0.1% of reading ±0.1% of range
5kHz to 15kHz:	±0.5% of reading ±0.25% of range
15kHz to 20kHz:	±0.75% of reading ±0.5% of range

Useable above 20kHz to 100kHz with typically an additional 1% error per 10 kHz.

1-1-3. Miscellaneous Voltage Specifications

Temperature Coefficient: ±10% of accuracy specification per °C

Crest Factor: 50:1 at minimum input linearly decreasing to 2.5:1 at full scale

Minimum Input: 5% of range

Maximum Input: ±1500V peak

Peak Indicator: Illuminates at 2.5 times range, or above the max RMS input for range

Input Impedance: 1MΩ (All Ranges)

1-2.Current Specifications

The accuracy figures given below are valid following a 1 hour warm-up period at the calibration temperature ±5°C. Figures are valid for a period of one year from the date of calibration.

1-2-1.Current Ranges, Resolution and Bandwidth

	Low Shunt	Medium Shunt	High Shunt
Ranges:	0.2A, 0.5A, 1A	2A, 5A, 10A	20A, 50A, 100A
Resolution:	<User-selectable at 4, 5 or 6 digits>		
Impedance:	100mΩ	10mΩ	1mΩ
Bandwidth:	DC & 30Hz-10kHz	DC & 30Hz-5kHz	DC & 30Hz-1kHz
Max Input:	2A continuous	20A continuous	150A continuous
Peak Input: (no damage)	100msec @5A (fused)	100msec @50A	100msec @500A

1-2-2. Current Accuracy

True RMS, DC coupled (AC+DC):

DC:	±0.50% of reading	±0.5% of range
30Hz to Bandwidth: (Shunt Dependant)	±0.25% of reading	±0.25% of range

1-2-3. Miscellaneous Current Specifications

Temperature Coefficient: ±10% of accuracy specification per °C

Crest Factor: 50:1 at minimum input linearly decreasing to 2.5:1 at full scale

Minimum Input: 5% of range

Peak Indicator: Illuminates at 2.5 times range, or above maximum RMS input for range

Shunt Compliance Voltage: 100mV at full scale on highest range for shunt (1A, 10A, 100A)

1-3.Power Specifications

The accuracy figures given below are valid following a 1 hour warm-up period at the calibration temperature ±5°C. Figures are valid for a period of one year from the date of calibration.

2-3-1. Power Accuracy and Bandwidth

True RMS, DC coupled (AC+DC):

DC:	±0.50% of volts x amps readings	±0.50% of volts x amps ranges
30Hz to Bandwidth: (Shunt Dependant)	±0.25% of volts x amps readings	±0.25% of volts x amps ranges

Bandwidth: DC and 30Hz to 10kHz (low shunt)
DC and 30Hz to 5kHz (medium shunt)
DC and 30Hz to 1kHz (high shunt)

Temperature Coefficient: ±10% of accuracy specification per °C

Power Factor Response: 0.01 to unity (1.000) power factor, leading or lagging

Power Factor Accuracy: ±0.005PF from 30Hz to 1000Hz
±0.010PF from 1kHz to 5kHz
±0.050PF from 5kHz to 10kHz

Phase Accuracy: Phase shift is a calculated value based on the V-A-W readings. Accuracy is equal to the combined uncertainties for voltage, current, and power. Typical phase accuracy is ±1° to 5kHz.

1-4. Physical Specifications

Height: 7" (178mm) not including feet
Width: 17" (432mm)
Depth: 19.75" (490mm)
Weight: 26 lbs (12kg) net; 31 lbs (14.5kg) shipping

1-5. Environmental Specifications

Temperature Range: Operating: 0°C to 50°C
Storage: -20°C to +75°C

Humidity: 70% RH max @ 40°C (non-condensing)

Power: 50 to 60Hz @ 105-125VAC or 210-250VAC; 60VA max

1-6. Miscellaneous Specifications

Settling Time (to within 0.05% of change):
No range change: 1.5 sec
Following range change: 5 sec

Maximum Common Mode Voltage: 1500V peak from any terminal to chassis

Input Configuration: Three-wire type wattmeter with three current inputs for each phase

Display Type: Vacuum-fluorescent, 4 rows, 42 characters per row

A-to-D Converter Resolution: 20 bit (1 million counts)
A-to-D Converter Conversion Rate: 212ms

Frequency counter response: 0.2Hz to 52kHz
Frequency counter accuracy: > 1Hz = ±0.01% of frequency ±250ns
< 1Hz = ±0.1% of frequency ±16.8ms

1-7. Performance Verification

Performance of the Model 2330A may be verified at any time, and is recommended following receipt of the unit or following transportation. Verification may be achieved with two levels: verified as operational; verified as operational and within specifications. The procedures for both follow.

1-7-1.Verification of Operation

If the 2330A fails any of the tests that follow, employ normal troubleshooting procedures or consult the factory for advice.

1) Ensure that the POWER switch (lower left hand corner of the front panel) of the 2330A is in the OFF position.
2) Ensure that the rear panel switch is set to the correct local line voltage and apply AC power to the 2330A. Make no connections to the shunt input terminals under the flip-lid.
3) Press the 2330A POWER switch to the ON position. The 2330A should come to life and introduce itself to the user.
4) Allow the 2330A to warm up for 15 minutes.
5) Connect the 2330A as described in Section 6-4-1 to a known resistive load, e.g. a 100-watt incandescent light bulb. Verify that the voltage display reads the present line voltage, the current display reads approximately 1 amp, and the power display reads approximately 100 watts. This should be repeated for each of the 3 channels: φA, φB and φC.

After successful completion of all of the steps above, the 2330A is fully operational with no faulty parts apparent.

1-7-2.Verification of Specification

Attempting to prove that the 2330A is performing to specification requires that the user be aware of the following points:

1) The specifications in Section 2 are valid for reasonable use of the 2330A during the specified period of time. If the 2330A has been transported it may have been subjected to extremes of temperature. As with any precision equipment some change in calibration may occur due to this. This effect has been carefully monitored by Valhalla Scientific and has been found to be small, even in extreme cases.
2) A wattmeter calibration system is required to verify the specifications of the 2330A. A source of voltage and current in phase with each other is required to check the power accuracy. Phase shifts between voltage and current will cause measurement errors. The calibration procedure of Section 8 may be used as a guide for verifying specifications.
3) Prior to specification verification it is recommended that the user be familiar with the manual operation of the 2330A and allow at least one hour for the unit to warm up.

If the 2330A is found to be fully operational but not performing to specifications it is recommended that a full calibration be performed. If this does not bring all points within specifications, contact your nearest Valhalla Scientific Service Center before returning the unit for repair or attempting to repair the unit yourself.