

**Model 930A**  
**Three Phase Power Analyzer**  
**Model 929A**  
**Three Phase Power Meter**

with

*PowerDSA™*

**Digital Signal Analysis**



Model 930A shown with included accessories

Arbiter Systems®, Inc. Models 930A, and 929A, with state-of-the-art *PowerDSA™* Digital Signal Analysis, make more measurements, more accurately, more easily, and at a lower price than ever before. Basic accuracy of 0.05% of reading and 0.05° phase, harmonic analysis, and full three-phase capability are standard on all three models. The 930A also incorporates full two-way serial communication for use in power quality trend monitoring.

#### Portability

Thanks to the high level of integration made possible with *PowerDSA™*, our instruments are lighter, smaller, and run longer on a charge than any others in this class. Smaller than a lunchbox and weighing only 5.8 kg (12.8 lbs), you can take any of our *PowerDSA™* instruments with you wherever you go, operate it continuously for a full eight-hour shift from its internal sealed lead-acid battery, and then recharge it completely in eight hours.

#### Safety

Built in a rugged, nonconductive, high-impact polyethylene case, and with all inputs isolated from instrument common by transformers, optical isolators or high-value series resistors, these instruments were designed with safety in mind. A front-panel ground terminal provides a sink for leakage currents.

#### Convenience

The outstanding features do not end with lightweight, measurement flexibility, or unprecedented accuracy. Many other user conveniences ease your workload.

- Bright, easy to read CCFL-backlit graphic display, with big, easy-to-read numeric results
- STORE, RECALL and LAST SETUP capability
- Built-in HELP text
- Opto-isolated serial interface (Model 930A)
- LOG DATA to internal memory (or an RS-232 printer with Model 930A), time and date tagged from the internal real-time clock

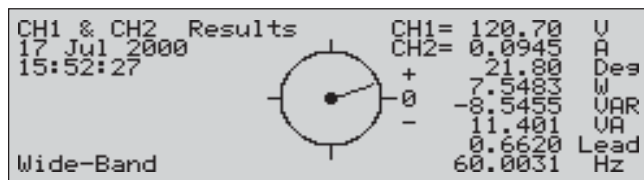
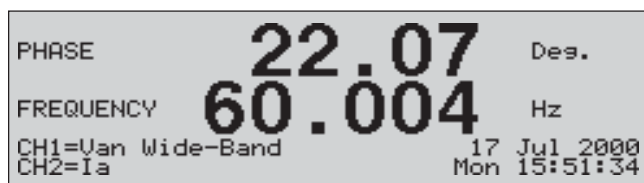
#### Accessories

Available accessories include a 400 Amp 20:1 precision CT, mounting brackets to provide for mounting of CTs inside the cover of the transit case, a wide selection of test leads, an adjustable tilt handle/bail assembly for the transit case, and an RS-232 cable.

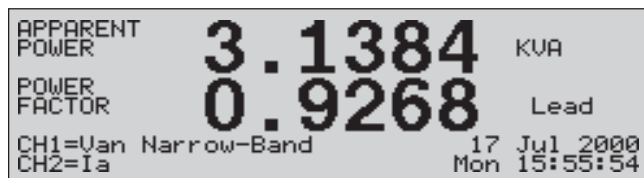
All of this, and more, is ready to help you do your job better and in less time. Put an Arbiter Systems® Model 930A, or Model 929A, all with *PowerDSA™* Digital Signal Analysis, to work for you soon!

## Model 930A/929A

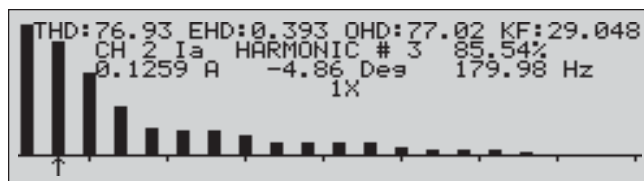
### Basic Measurements



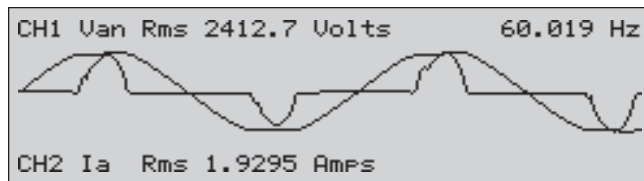
### Power Quantities



### Harmonics



### Waveform Display



The 930A and 929A measure all of the basic quantities: true-rms voltage and current, frequency and phase angle. *PowerDSA™* analysis measures these quantities more accurately than ever before. Accuracy is 0.05% for voltage and current and 0.05° for phase.

The proprietary *PowerDSA™* narrow-band mode even measures the fundamental signal alone, rejecting the effects of harmonics and noise. In wide-band mode, the effects of all harmonics and noise are included. Phase angle is always true, fundamental phase, and frequency is accurate even with large harmonics causing multiple zero crossings. Accuracy is never degraded, even with real-world signals.

The *PowerDSA™* instruments measure power quantities, too, with accuracy unprecedented for a lightweight, portable instrument. Measurements are made in accordance with IEEE standards, including the effects of harmonics and reactive power. Watts (W), watthours (Wh), volt-amperes (VA), volt-ampere hours (VAh), volt-amperes reactive (VAR), volt-ampere reactive hours (VARh), and power factor (PF): *PowerDSA™* analysis measures them all, with 0.11% basic accuracy.

Measure harmonics and view the results graphically; as summary numbers, such as total harmonic distortion (THD), even harmonic distortion (EHD), odd harmonic distortion (OHD) or K-factor; or as individual harmonic amplitude and phase. The bandwidth extends to over 3 kHz for accurate measurement to the 50<sup>th</sup> harmonic on 50 or 60 Hz systems, now you can know for sure what is really happening on your system.

You can view the signal waveforms for both channels on the high contrast 240x64 graphic display. Both channels are normalized to Channel 1 fundamental phase, so you can see, for example, the relationship between current waveform distortions and voltage phase.

## Model 930A/929A

### Three-Phase Measurement

```

A:122.70 B:121.95 C:121.90 * 122.18 U
10.753 10.112 8.6162 * 9.8275 A
-26.96 -38.56 -27.64 * -31.05 Des
1.1752 0.9629 0.9287 T 3.0669 KW
0.6001 0.7704 0.4906 T 1.8612 KVAR
1.3195 1.2332 1.0504 T 3.6031 KVA
0.8906 0.7808 0.8842 * 0.8519 Lag
60.00Hz Wide-Band ABC 3P 4W 3E LOG 1

```

```

A: 122 U REF      C
6.48 A -24      C
B: 122 U -118    B
6.47 A -159    A
C: 122 U 118     A
6.47 A 85
3P 4W 3E      VOLTAGE CURRENT

```

```

A:122.57 B:121.67 C:121.71 N: LOG U
REF -119.71 120.93 3 Des
10.700 10.010 8.5273 0.1331 A
-26.81 -158.04 92.62 22.30 Des
U1: 121.98 U2: 0.8144 U0: 0.4328 U
REF -32.40 -103.15 Des
I1: 9.7055 I2: 1.2664 I0: 0.0444 A
-30.82 7.40 -157.70 Des

```

```

A:117.45 B:120.04 C:118.11 * 118.53 U
8.6627 11.491 10.558 * 10.237 A
-23.62 -23.44 -39.54 * -28.87 Des
930.70 1264.7 961.02 H 40.438 W
411.17 550.79 794.72 H 21.927 VAR
1017.4 1379.4 1247.0 H 46.315 VA
0.9147 0.9168 0.7706 * 0.8674 Lag
60.00Hz Wide-Band ABC 3P 4W 3E LOG 6

```

### CT/PT Ratios

```

CH1/CH2      201.15 P/U
PHASE        0.38 Des
CH1=Ia Wide-Band 25 Aug 1996
CH2=Ib Sun 13:11:40

```

### Extended Measurement Ranges

```

ACTIVE POWER      207.53 KWatt
REACTIVE POWER    119.85 KVar
CH1=Van Wide-Band 29 Aug 1996
CH2=Ia Thu 09:14:42

```

The Models 930A and 929A include a full three-phase input section, for automated three-phase measurement sequences. PowerDSA™ analysis measures two signals at a time, and the results are combined into four complete three-phase displays.

You can select from the following three-phase display modes:

- Basic three-phase display  
View voltage, current, phase, frequency and power quantities on one convenient display.
- Vector display  
View voltages, currents and phase angles with their vector representation.
- Voltage/Current Sequence display  
View voltage, current and phase along with positive, negative and zero sequence values.
- Energy display  
View voltage, current, phase, frequency and energy quantities on one convenient display.

As a power trend monitor and recording system, these PowerDSA™ instruments can verify phase relation, phase rotation, power direction, load balance and positive, negative, and zero sequence of voltage and/or current as well as calibrating and verifying in-service performance of Disturbance, Fault and Transient Recorders.

Correction factors for external CTs and/or PTs can be entered to display the measured results in input-side units. You can even measure ratios using the instrument's CH1/CH2 function. This example shows a nominal 200:1 (or 1000:5) current ratio; if Channel 1 is a CT burden voltage and Channel 2 CT secondary current, the result is the loop resistance in ohms.

For greater accuracy, the Model 09311A Auxiliary CT allows measurement of signals up to 400 amps with total basic accuracy of 0.1%. This CT mounts directly to the Model 930A, or 929A current input connectors and may be used for one, two or three of the current inputs, depending on your needs.

## Model 930A/929A Specifications

### Input

#### Basic Inputs

The Arbiter Systems®, Inc. Models 930A and 929A have two main measurement channels, Channel 1 and Channel 2. Any voltage or current input signal may be selected for either channel. For basic measurements (voltage, current, frequency, phase angle) any combination of inputs may be used. For power and energy measurements (active power, apparent power, reactive power and power factor), one voltage and one current must be selected. For three-phase measurements, the input configuration is selected automatically, based on the measurement type (for example, 3-phase 4-wire 3-element).

#### Voltage

Input Range	1.5 to 750 Vrms (underrange to 200 mV)
Inputs	Four; A, B, C, N: Phase-to-Phase Phase-to-Neutral Phase-to-Synthesized Neutral (A+B+C)/3
Impedance	1 megohm
Leakage	< 3.5 mA per IEC348 and UL1244

#### Current

Input Range	0.04 to 20 Arms (underrange to < 1 mA)
Inputs	Three; A, B, C, plus synthesized neutral
Burden	0.01 ohm maximum
Isolation	Transformer, 1000 Vrms
Neutral	Synthesized, -(A+B+C)

### Measurements

#### Voltage and Current

Method	Wideband: True rms, 3 kHz Bandwidth Narrowband: Fundamental magnitude
Accuracy	0.05% of reading
Underrange	< 1% of reading, typical at 0.3 mArms

#### Phase Angle

Input	Channel 1 to Channel 2
Range	0 to 360° or ±180°
Accuracy	0.05°
Underrange	< 1°, typical at 0.3 mArms

#### Frequency

Input	Channel 1
Range	20 to 500 Hz (underrange to 5 Hz)
Accuracy	0.005% of reading

#### Harmonics

Input	Channel 1 or Channel 2
Range	2 <sup>nd</sup> to 50 <sup>th</sup> Harmonic (50 or 60 Hz fundamental)
Accuracy	0.01% THD + 5% of reading
Display	THD; K-factor; Amplitude bar graph; and individual harmonic magnitude and phase (simultaneous)

#### Waveform

Display	Channel 1 and/or Channel 2
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#### Power / Energy Quantities

Range	0 to 99999 MVA or MVAh ±99999 MVAR or MVARh ±99999 MW or MWh ±1.0000 PF, lead or lag
Accuracy	0.11% of VA, for VA, VAR, and W 0.001 PF

**Model 930A/929A Specifications****Interface****Operator Interface**

Display	240x64 graphic LCD with cold-cathode fluorescent lamp (CCFL) backlight
Keyboard	21 function keys plus On/Off
Memory	EEPROM (calibration data) Battery backup RAM (setup and stored results) Real-time clock
Data	Instrument calibration data User setups (up to six) Logged data (15 to 200); time-tagged

**System Interface<sup>1</sup>**

RS-232	1200 to 115,200 baud; 7/8 data bits; 1/2 stop bits; even/odd/no parity
Isolation	Optical, 300 Vrms

**Power Requirements****Internal Battery**

Type	Sealed lead-acid
Operation	8 hours typical
Charge	8 hours typical; fast + float charge

**External Power**

Range	85 to 264 Vac, 47 to 440 Hz, 15 VA max. 110 to 250 Vdc, 15 W maximum
Safety	Designed to meet UL, CSA, VDE

**General****Physical**

Size	205 x 305 x 225 mm (8 x 12 x 8.75 in.) 483 x 483 x 483 mm (16 x 16 x 16 in.), shipping
Weight	5.8 kg (12.8 lbs), maximum 8.2 kg (18 lbs), shipping

**Environmental**

Temperature	Operating: -10° to +50° C Nonoperating: -40° to +75° C
Humidity	Noncondensing

<sup>1</sup> Model 930A only



## Model 930A Specifications

The Arbiter Systems®, Inc. Model 930A Three Phase Power Analyzer is an economical alternative to the Model 931A Power System Analyzer when the dc voltage measurement, transducer calibration and timer features are not required. The Model 930A has the same ac accuracy as the Model 931A with PowerDSA™ Digital Signal Analysis. The Model 930A with serial communication capability and available application software, in conjunction with a laptop computer, is a valuable tool for use in power quality trend monitoring, as well as being a complete diagnostic tool for use in the substation and industrial power environment.

### Accessories

#### Included

Description	Order No.
Operation Manual	PD0024400
Power Cord (see below)	P01R-P10R
RS-232 Null Modem Cable, DB9F-DB9F, 2 m (6 ft) length	CA0019806
Safety Ground Lead	812HC-8

#### Available

Description	Order No.
400 Amp 20:1 Precision CT, 0.1% Accuracy	09311A
400 Amp CT Bracket (each)	AS0036000
930A Application Software: PowerCSV	AS0060000
Adjustable Tilt Handle/Bail Assembly	AS0035901
3-Phase Safety Voltage Lead Set	813AT
3-Phase Spade-Lug Current Lead Set	816AT
3-Phase Univ. Test Plug Current Lead Set	811AT
1-Phase Clamp-On CT Test Lead	817AA
3-Phase Clamp-On CT Test Lead Set	817AT
3-Phase Safety C-Hook Current Lead Set	818AT

Additional Test Leads are available. Contact factory.

## Model 929A Specifications

The Arbiter Systems®, Inc. Model 929A Three Phase Power Meter is an economical alternative to both the Model 931A Power System Analyzer and the Model 930A Three Phase Power Analyzer when serial communication, dc voltage measurement, transducer calibration and timer features are not required. The Model 929A has the same ac accuracy as the Model 931A with PowerDSA™ Digital Signal Analysis, and is a complete diagnostic tool for use in the substation and industrial power environment.

### Accessories

#### Included

Description	Order No.
Operation Manual	PD0024400
Power Cord (see below)	P01R-P10R
Safety Ground Lead	812HC-8

#### Available

Description	Order No.
400 Amp 20:1 Precision CT, 0.1% Accuracy	09311A
400 Amp CT Bracket (each)	AS0036000
100:1 Clamp-on CT, 100 Amp	AP0009800
Adjustable Tilt Handle/Bail Assembly	AS0035901
3-Phase Safety Voltage Lead Set	813AT
3-Phase Spade-Lug Current Lead Set	816AT
3-Phase Univ. Test Plug Current Lead Set	811AT
1-Phase Clamp-On CT Test Lead	817AA
3-Phase Clamp-On CT Test Lead Set	817AT
3-Phase Safety C-Hook Current Lead Set	818AT

Right Angle Power Cord styles:

No.	Country	Specification	Rating
P01R	Cont Europe	CEE7/7	220V
P02R	Aust/NZ/PRC	AS 3112-1981	240V
P03R	U.K.	BS 1363	240V
P05R	India	BS 546	220V
P07R	Italy	CEI 23-16-VII 1971	220V
P09R	N America and ROC	NEMA 5-15P CSA C22.2 #42	120V

## POWERCSV SOFTWARE

Three Phase Tabular Log 06-22-2000 13:06:27 - 93X-Export/Configure							
Time	Log Type	3 Phase Direction	3 Phase Frequency	3 Phase Phase	3 Phase Volts Wide	3 Ph Current Wide	3 Ph Power Factor Wide
06-22-2000 13:06:27	Three Phase Tabular Log	---	60.002857	-26.037788	118.751884	12.317155	0.891970
06-22-2000 13:06:28	Three Phase Tabular Log	---	60.002857	-26.037788	118.751884	12.317155	0.891970
06-22-2000 13:06:29	Three Phase Tabular Log	---	60.002705	-26.848222	118.679932	12.055417	0.886633
06-22-2000 13:06:30	Three Phase Tabular Log	---	60.002705	-27.308666	118.644531	12.229108	0.883250
06-22-2000 13:06:31	Three Phase Tabular Log	---	60.002705	-26.939113	118.400146	12.000585	0.886351
06-22-2000 13:06:32	Three Phase Tabular Log	---	60.002705	-26.939113	118.400146	12.000585	0.886351
06-22-2000 13:06:33	Three Phase Tabular Log	ABC	60.002705	-26.939113	118.400146	12.000585	0.886351
06-22-2000 13:06:34	Three Phase Tabular Log	ABC	60.002705	-26.939113	118.400146	12.000585	0.886351
06-22-2000 13:06:35	Three Phase Tabular Log	ABC	60.004459	-26.148143	118.337486	12.139909	0.891554
06-22-2000 13:06:36	Three Phase Tabular Log	ABC	60.004459	-26.618492	118.290637	11.924893	0.880207
06-22-2000 13:06:37	Three Phase Tabular Log	ABC	60.004459	-26.515360	118.533562	11.958455	0.889761
06-22-2000 13:06:38	Three Phase Tabular Log	ABC	59.999367	-27.506236	118.559814	11.783825	0.883212
06-22-2000 13:06:39	Three Phase Tabular Log	ABC	59.999367	-26.520379	118.522644	11.870475	0.890941
06-22-2000 13:06:40	Three Phase Tabular Log	ABC	59.999367	-27.808495	118.606178	11.795836	0.876944
06-22-2000 13:06:41	Three Phase Tabular Log	ABC	60.001060	-26.842580	118.553047	11.917770	0.883363
06-22-2000 13:06:42	Three Phase Tabular Log	ABC	60.001060	-27.746851	118.593193	11.746662	0.877197
06-22-2000 13:06:43	Three Phase Tabular Log	ABC	60.001060	-26.712788	118.534981	11.807023	0.887932
06-22-2000 13:06:44	Three Phase Tabular Log	ABC	59.985378	-27.692116	118.513161	11.609840	0.881431
06-22-2000 13:06:45	Three Phase Tabular Log	ABC	59.985378	-26.724962	118.594761	11.656562	0.888102
06-22-2000 13:06:46	Three Phase Tabular Log	ABC	59.985378	-27.782496	118.529541	11.653908	0.877288
06-22-2000 13:06:47	Three Phase Tabular Log	ABC	59.993950	-26.895275	118.565636	11.605636	0.883658
06-22-2000 13:06:48	Three Phase Tabular Log	ABC	59.993950	-27.509420	118.547752	11.683825	0.878732
06-22-2000 13:06:49	Three Phase Tabular Log	ABC	59.993950	-27.626836	118.564186	11.540700	0.877259
06-22-2000 13:06:50	Three Phase Tabular Log	ABC	59.992325	-27.417883	118.570496	11.588788	0.878570
06-22-2000 13:06:51	Three Phase Tabular Log	ABC	59.992325	-27.754071	118.582306	11.555535	0.876165
06-22-2000 13:06:52	Three Phase Tabular Log	ABC	59.992325	-27.669281	118.520297	11.490125	0.876988
06-22-2000 13:06:53	Three Phase Tabular Log	ABC	59.988884	-27.755727	118.544312	11.471250	0.876476
06-22-2000 13:06:54	Three Phase Tabular Log	ABC	59.988884	-27.502884	118.532616	11.442810	0.878284
06-22-2000 13:06:55	Three Phase Tabular Log	ABC	59.988884	-27.710894	118.588890	11.524652	0.876278
06-22-2000 13:06:56	Three Phase Tabular Log	ABC	59.988426	-26.954193	118.607666	11.487340	0.868143
06-22-2000 13:06:57	Three Phase Tabular Log	ABC	59.988426	-29.175430	118.663902	11.247800	0.866719
06-22-2000 13:06:58	Three Phase Tabular Log	ABC	59.988426	-28.240986	118.587677	11.096139	0.876288
06-22-2000 13:06:59	Three Phase Tabular Log	ABC	59.995647	-27.167373	118.590790	11.160233	0.883338
06-22-2000 13:07:00	Three Phase Tabular Log	ABC	59.995647	-27.261582	118.578545	11.340623	0.882259
06-22-2000 13:07:01	Three Phase Tabular Log	ABC	59.995647	-28.303887	118.578438	11.407176	0.871441

Enhance the performance of your Model 930A Three Phase Power Analyzer with the new PowerCSV software (order number AS0060000). The PowerCSV software allows a computer, via the serial port, to import and view data from the extended memory of the Models 930A. The PowerCSV also has the ability to export a comma-delineated file of the data for easy viewing in any spreadsheet program.

Requires that the Optional 16 MB of Internal Data Memory is installed.

The PowerCSV software is available on our web site: "<https://www.arbiter.com>".