

Three-Phase Power Quality Analyzer PowerPad® Model 3945-B

Display and record waveforms, transients, trend data and events simultaneously!



TRANSCAT®

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Wouldn't it be nice if you could look inside your electrical system and see what's going on? Troubleshooting would be so much easier if you could see the volts, amps and harmonic content in real time and take pictures to document and analyze. Now you can do just that and more with AEMC's PowerPad. The full color graphical display lets you see and analyze each signal clearly. Its high speed sample rate, at 256 samples per cycle, provides excellent fidelity in reproducing waveforms and capturing transients that happen as fast as $62.5\mu\text{s}$.

PowerPad's 4MB of memory is conveniently partitioned to let you store four different types of data, synchronized or independent of each other. You can store up to 12 screen snapshots, up to 50 captured transients that contain four cycles for each active input, and 4096 alarm events. You can also record trend data for days, weeks or even months.

Six direct access function buttons quickly let you see:

Waveforms – Display Volts, Amps, THD and Crest Factor by phase or for all phases. You can display all the voltage inputs on one screen, phase-to-phase or phase-to-neutral. Real-time phasor

diagrams can be displayed for volts and amps, also by phase or for all phases.

Harmonics – Display Harmonics out to the 50th for Volts, Amps and VA. Individual Harmonics are displayed as a percentage and in real value. Harmonic direction and sequencing can also be displayed.

Transients – Set, capture and display transients. You select the threshold and the number of transients to capture. PowerPad then captures four waveforms for each transient; the triggering waveform as well as one pre- and two post-triggered waveforms. As many as 1200 waveforms can be captured.

Alarms – Configure, capture and display up to 4096 alarm events based on up to ten different trigger variables. Each captured alarm event will show the phase, the variable and the value as well as the time and duration.

Record – Set up and record trend data at selectable rates from one sample/second to one sample every 15 minutes on as many as 22 different variables for all phases. See the recorded data on screen, zoom in and out and scroll the time axis to analyze the data.

Power & Energy – Display Watts, VARs and VA by phase and total. Accumulate totals and see whether the energy is inductive or capacitive.

If you're not convinced yet, consider these other functions and features:

- PowerPad uses current probes that auto configure the instrument's current channel for range and scale.
- PowerPad comes with an online help system that gives you clear information about the functions and buttons for each screen.
- PowerPad comes with all options and accessories needed to capture, display, download, analyze and store data. No add-on accessories are required that increase your cost. PowerPad is supplied with AEMC's DataView® graphing/analysis software package at no additional cost

(a \$395.00 value). The software lets you completely configure and capture data in real time on your computer. You can download all stored data from PowerPad and print reports from a library of pre-designed templates or create your own custom templates and reports.

In addition to all of this, PowerPad speaks six different languages. At the press of a button, information can be displayed in English, Spanish, French, Portuguese, Italian and German.

Arrange for a demonstration today!



Tilt-out bail facilitates bench top operation for convenient viewing of display.

Features

- True RMS single-, two- and three-phase measurements at 256 samples/cycle, plus DC
- Real-time color waveforms
- Easy-to-use on-screen setup
- Automatic current probe recognition and scaling
- True RMS voltage and current measurement
- Measures DC volts, amps and power
- Display and capture voltage, current and power harmonics to 50th order, including direction, in real time
- Capture transients down to 1/256th of a cycle
- Phasor diagram display
- Peak voltage and current
- Nominal frequency from 40 to 70Hz
- VA, VAR and W per phase and total
- kVAh, VARh and kWh per phase and total
- Neutral current display for three-phase
- Crest factors for current and voltage
- Transformer K-factor display
- Power Factor, displacement PF display
- Captures up to 50 transients
- Short-term flicker display
- Phase unbalance (current and voltage)
- Harmonic Distortion (total and individual) from 1st to 50th
- Alarms, surges and sags
- Records date and characteristics of disturbances
- Immediate printout directly to a printer
- Screen snapshot function captures waveforms or other information on the display
- Optically isolated RS-23 communication port
- Includes DataView[®] software for data storage, real-time display, analysis and report generation
- 600V Cat. IV safety rating

Applications

- Verification of power distribution circuits
- Measurement and recording of power system quality (kW, VA, VAR)
- Energy metering (kVAh, VARh, kWh)
- In plant troubleshooting of power distribution panels and individual machinery
- Monitor pad mount transformers
- Determine harmonic problems originating from source or load
- Monitor phase unbalances
- Determine transformer K-factor
- And much, much more



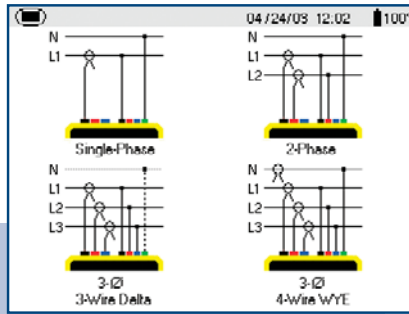
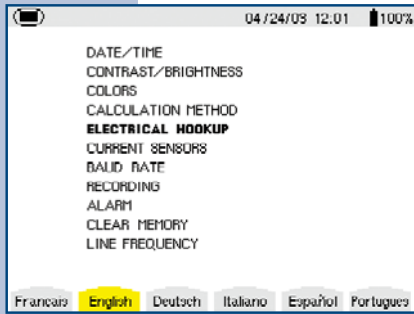
Power quality analysis on a three-phase panel using the AmpFlex[®] flexible current probes.



Measure all three phases of voltage and current simultaneously.

Functional Displays

Configuration



Configuration is simple and straightforward. Simply press the setup button and select the function you wish to configure. For example, to configure the input, select the desired hookup from the graphical choices for single-, two- and three-phase. Neutral current is calculated in the 4-wire hookup.

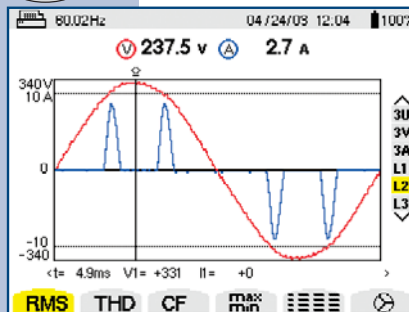
PowerPad's direct access system lets you see the important information you need at the press of a button. Quickly review waveforms, harmonics, transients, alarms and recorded data on screen. Setup is straightforward using a combination of graphic and text prompts to quickly configure PowerPad for the job site.

Snapshot Mode



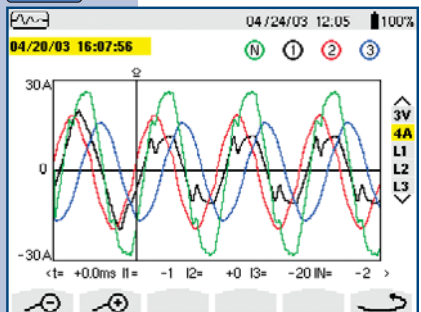
You can store up to 12 screen snapshots simply by pressing the camera button while the desired information from any of the instrument's modes is on the display. Any of the stored snapshots can be selected and displayed by selecting it from the list.

Printing



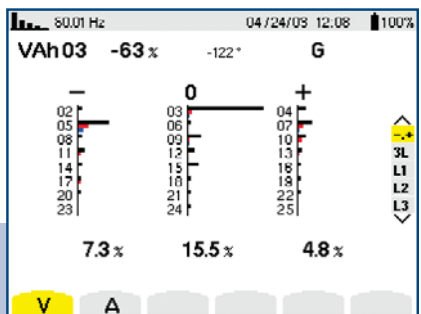
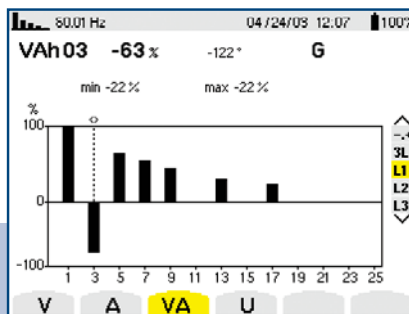
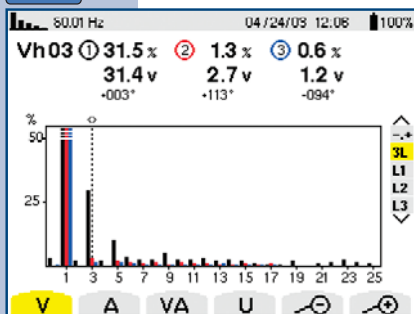
Information on screen (real-time or stored data) can be sent to a printer using the serial interface by simply pressing the print button.

Transient Mode



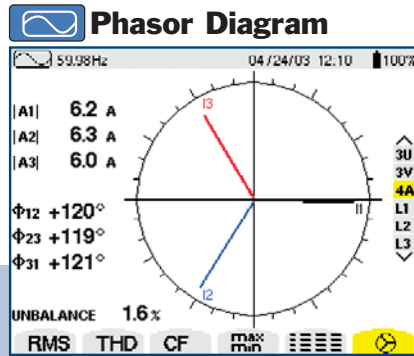
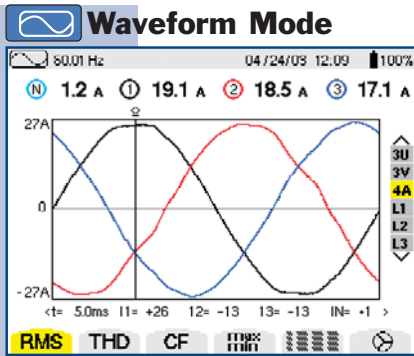
Display transients that were captured – each transient consisting of one pre-triggered cycle, the triggered cycle and two post-triggered cycles. All inputs are stored when a transient is captured. Up to 50 transients can be stored, each consisting of four cycles and up to six inputs for a total of 1200 transient waveforms.

Harmonics Mode



Voltage, current and power harmonics can be displayed in real time, in bargraph and text form, and stored in memory. Individual harmonics can be analyzed by moving the horizontal cursor to that harmonic. Harmonic direction (source-to-load or load-to-source) can be displayed for power harmonics. Harmonic sequencing (negative, zero and positive) can be displayed for volts or amps for all phases.

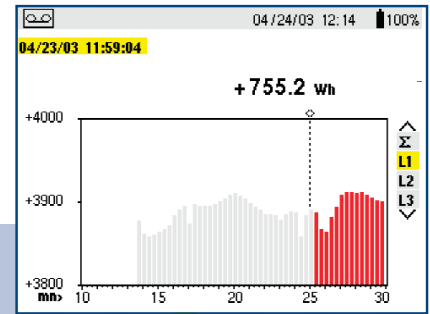
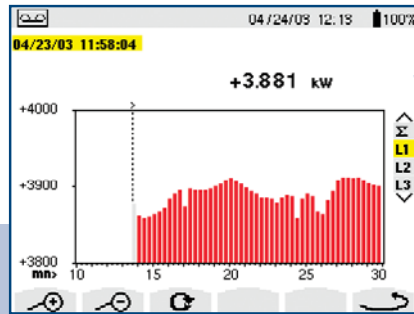
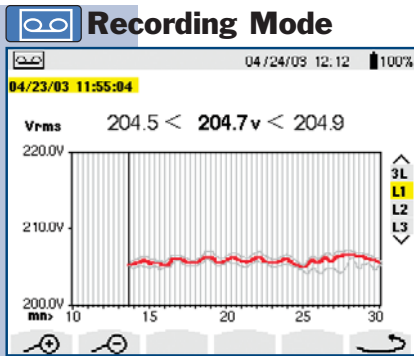
Functional Displays



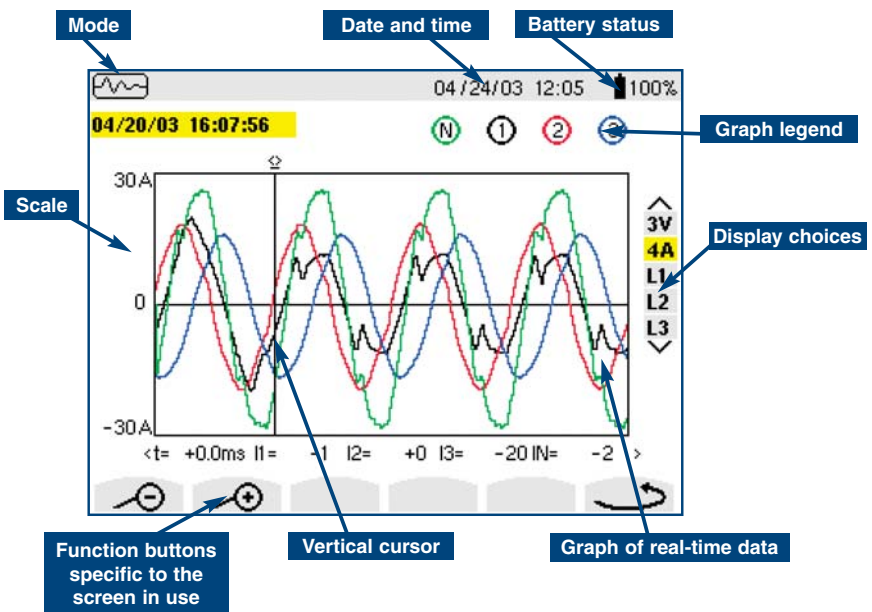
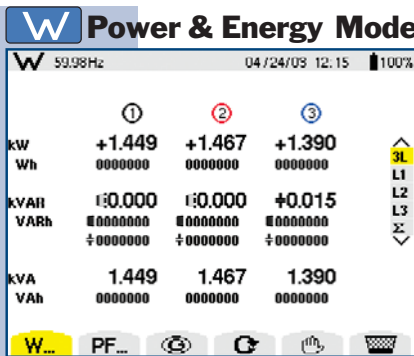
Date	Time	Function	Value	Duration
04/23/03	11:55:04	010	nsT	IJ
04/23/03	11:55:04	A1	ema	IJ
04/23/03	11:55:04	A0	ema	SJ
04/23/03	11:55:04	A0	ema	EJ
04/23/03	11:55:04	010	nsT	IJ
04/23/03	11:55:04	W82	W	IJ
04/23/03	11:55:04	A1	ema	IJ
04/23/03	11:55:04	A0	ema	SJ
04/23/03	11:55:04	A0	ema	EJ
04/23/03	11:55:04	W548	W	IJ
04/23/03	11:55:04	W8281	W	SJ

Real-time waveforms can be displayed for any and all inputs. In RMS, THD and Crest Factor presentations, Phasor Diagrams can be displayed graphically, showing the phase relationship as well as actual values for phase-to-phase voltage and current. Percent unbalance is also displayed.

Up to 4096 alarm conditions can be recorded and displayed. Each alarm shows date, time, function, value and duration (down to 10ms).



Trend recording from one to 22 variables and from one to six inputs can be programmed, stored and displayed at storage rates between one second and 15 minutes. Data can be analyzed on screen by moving the horizontal cursor to see MIN, MAX and instantaneous values as well as time and date. The time axis can be zoomed in or out. Power and energy consumption can also be recorded and displayed.



Power and Energy can be displayed by phase or total, including kW, Watt-hours, VAR hours, VA and VA hours. The energy can be totalized and the inductive and capacitive components are also displayed.

Specifications

MODEL	3945-B		
ELECTRICAL			
Sampling Frequency	256 samples per cycle		
Data Storage	4MB partitioned for waveforms, transients, alarms and trend recording		
Voltage (TRMS)	Phase-to-Phase: 960V		Phase-to-Neutral: 480V
Current (TRMS)	MN Clamp: 0 to 6A/120A or 0 to 240A MR Clamp: 0 to 1000A _{AC} , 10 to 1400A _{DC}		SR Clamp: 0 to 1200A AmpFlex®: 0 to 6500A ¹
MEASUREMENT	RANGE	RESOLUTION	ACCURACY
Single-Phase RMS Voltages	15 to 480V	0.1V	±0.5% ± 2cts
Phase-to-Phase RMS Voltages	15 to 960V	0.1V	±0.5% ± 2cts
DC Voltage Component	15 to 680V	0.1V	±1% ± 2cts
Single-Phase Peak Voltages	15 to 680V	1V	±(1% + 5cts)
Phase-to-Phase Peak Voltages	15 to 1360V	1V	±(1% + 5cts)
Frequency (Hz)	40 to 69Hz	0.01Hz	±0.01Hz
Current Probes (Arms)			
MN Clamp	0 to 240A	0.1A	±(0.5% + 2cts)
SR Clamp	0 to 1200A	0.1A; 1A ≥ 1000A	±(0.5% + 2cts)
AmpFlex® Probe	10 to 6500A	0.1A; 1A ≥ 1000A	±(0.5% + 1A)
Active (Real) Power (kW)	0 to 9999kW	4 digits (10,000ct)	±1% ± 1ct @ PF ≥ 0.8
Reactive Power (kVAR)	0 to 9999kVAR	4 digits (10,000ct)	±1% ± 1ct @ PF ≤ 0.8
Apparent Power (kVA)	0 to 9999kVA	4 digits (10,000ct)	±1% ± 1ct
Power Factor (PF & DPF)	-1.000 to 1.000	0.001	±(1.5% + 0.01)
Active Energy (kWh)	0 to 9999MWh	4 digits (10,000ct)	±1% ± 1ct @ PF ≥ 0.8
Reactive Energy (kVARh)	0 to 9999MVARh	4 digits (10,000ct)	±1% ± 1ct @ PF ≤ 0.8
Apparent Energy (kVAh)	0 to 9999MVAh	4 digits (10,000ct)	±1% ± 1ct
Unbalance (V & A)	0 to 100%	0.1%	±1% ± 1ct
Phase Angle (V-A, A-A, V-V)	-179° to +180°	1°	±2° ± 1ct
Harmonics (1 st to 50 th) F = 40 to 69Hz (V ≥ 50V, A > Inom/100)	0 to 999%	0.1%	±1% + 5cts
Total Harmonic Distortion (V & A)	0 to 999%	0.1%	±1% + 5cts
K-factor (Akt)	1 to 99.99	0.01	±5% ± 1ct
Flicker (Pst)	0.00 to 9.99	0.01	-
Power Source	9.6V NiMH rechargeable battery pack AC supply: 110/230V _{AC} ±20% (50/60Hz)		
Battery Life	≥8 hrs with display on; ≤35 hrs with display off (record mode)		
MECHANICAL			
Dimensions	9.5 x 7 x 2" (240 x 180 x 55mm)		
Weight	4.6 lbs (2.1kg)		
DISPLAY			
Display Type	1/4 VGA (320 x 240) color LCD		
ENVIRONMENTAL			
Operating Temperature	32° to 122°F (0° to 50°C)		
Storage Temperature	-4° to 122°F (-20° to +50°C)		
SAFETY			
Safety Rating	EN 61010-1, 600V Cat. IV ² , Pollution Degree 2		
Double Insulation <input type="checkbox"/>	Yes		
CE Mark	Yes		

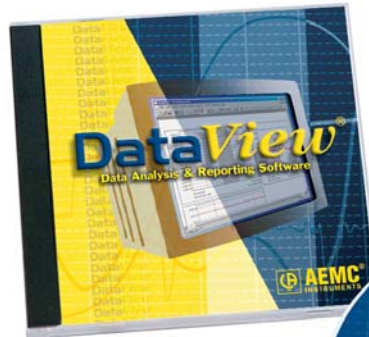
⁽¹⁾ Crest factor at 6500 = 1 ⁽²⁾ When used with SR193 or AmpFlex® probes.
600V Cat III with MN193 or MR193 probes

DataView[®] Software

Features

Configure all functions of the PowerPad[®] Model 3945-B

- Display and analyze real-time data on your PC
- Configure all PowerPad functions and parameters from your PC
- Customize views, templates and reports to your exact needs
- Create and store a complete library of configurations that can be uploaded to the PowerPad as needed
- Zoom in and out and pan through sections of the graph to analyze the data
- Display waveforms, trend graphs, harmonic spectrums, text summaries, transients, event logs and stored alarms
- Print reports using standard or custom templates you design



DataView is included with the PowerPad Model 3945-B.



The DataView software provides a convenient way to configure and control power analysis tests from your computer. Through the use of clear and easy-to-use tabbed dialog boxes, all PowerPad functions can be configured and tests can be initiated. Results can be displayed in real time and stored in your PC. Reports may be printed along with the operator's comments and analysis.

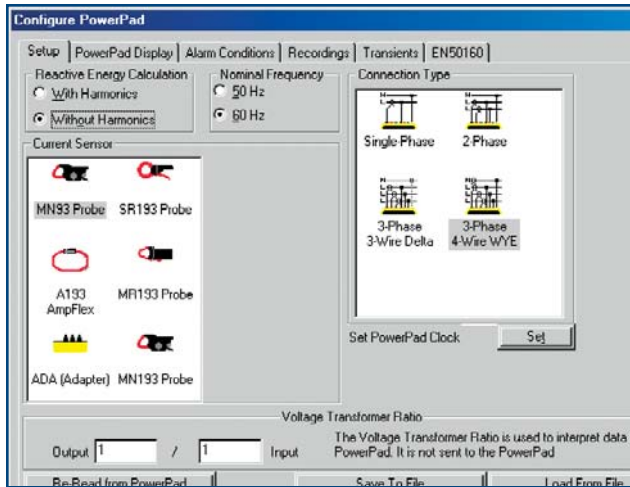
Minimum System Requirements

- Windows[®] 98/2000/ME/XP or Windows[®] NT 4.0
- 128MB of RAM (256MB recommended) for Windows[®] 98/2000/ME or Windows[®] NT 4.0
- 256MB of RAM for Windows[®] XP
- 35MB of hard disk space (200MB recommended)
- CD Rom Drive

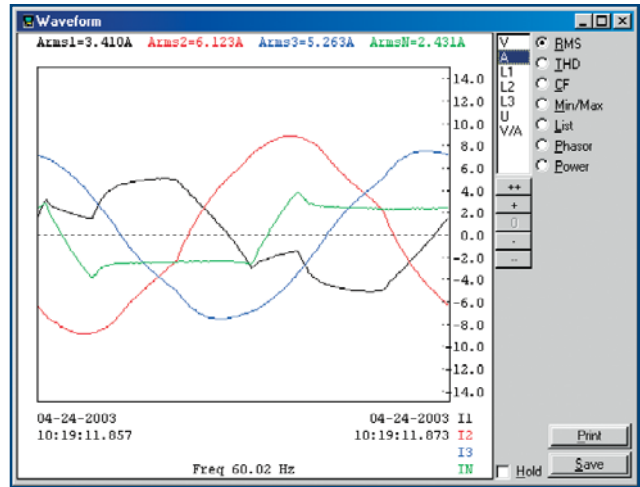


Display waveforms in real time on your computer.

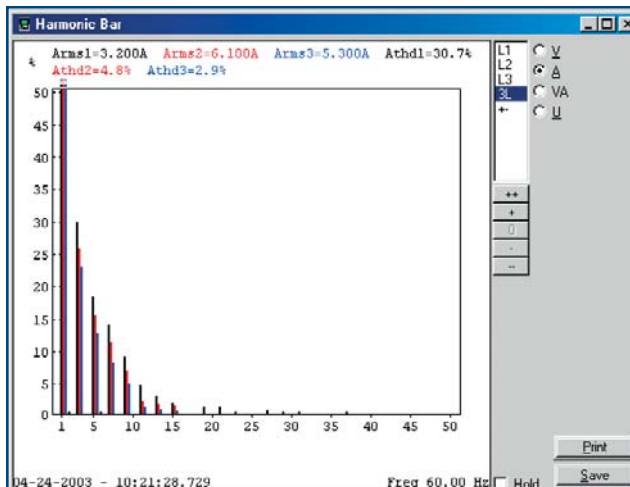
DataView® Screens



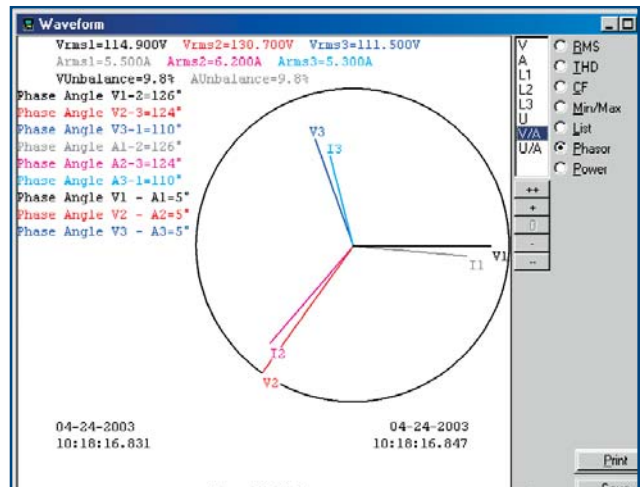
Clear and easy setup of all functions from one tabbed dialog box.



Display real-time waveforms by phase, parameter or total.



Display all harmonics from 1st to 50th in bargraph form for voltage, current and power.



Display real-time phasor diagrams. Includes unbalance for both voltage and current.

Parameter	Value
W	= 269.966
VAR	= -114.487
VA	= 377.734
W/h Source	= 0.601
W/h Load	= 0.000
VARh Capacitive Source	= 0.191
VARh Inductive Source	= 0.000
VAh Source	= 0.631
VAh Load	= 0.000
PF	= 0.953
DPF	= 0.957
Tan	= -0.078

Display power and energy parameters – both instantaneous and total.

k	Mag	Phase	k	Mag	Phase	k	Mag	Phase
H00	0.0	0	H01	100.0	0	H02	0.0	0
H04	0.0	0	H05	2.2	-127	H06	0.0	0
H08	0.0	0	H09	0.3	142	H10	0.0	0
H12	0.0	0	H13	0.4	34	H14	0.0	0
H16	0.0	0	H17	0.2	-72	H18	0.0	0
H20	0.0	0	H21	0.1	164	H22	0.0	0
H24	0.0	0	H25	0.0	0	H26	0.0	0
H28	0.0	0	H29	0.0	0	H30	0.0	0
H32	0.0	0	H33	0.0	0	H34	0.0	0
H36	0.0	0	H37	0.0	0	H38	0.0	0
H40	0.0	0	H41	0.0	0	H42	0.0	0
H44	0.0	0	H45	0.0	0	H46	0.0	0
H48	0.0	0	H49	0.0	0	H50	0.0	0

Display harmonics in a text table from harmonic 0 (DC) through the 50th.

DataView® Sample Reports

Transient Report

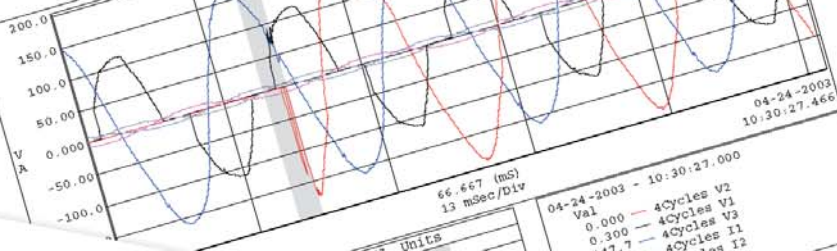
Database: C:\Program Files\DataView\Samples\PowerPad\Transient.dvb
 Operator: AEMC Instruments
 Joe
 200 Foxborough Blvd
 Foxborough Blvd, MA
 508-698-2115

Test Site: AEM Systems
 Plant Mgr
 123 Any Street
 Any City, MA 12345

Recording Start Date: 04-24-2003 - 10:30:27
 Recording Duration: 0 (s)
 Instrument ID: Model: 3945 - 1 1 100132

Comments: Transient Analysis of phase drop out on

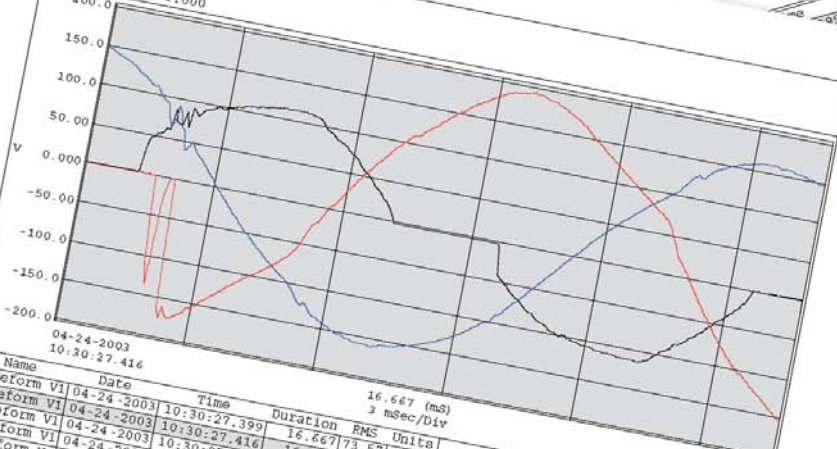
Transient Report



RMS Units	V	A	A	A
110.2	110.2	75		
75		75		
			75	
				75

04-24-2003 - 10:30:27.000
 Val: 0.000 - 4Cycles V2
 0.300 - 4Cycles V1
 147.7 - 4Cycles V3
 -0.200 - 4Cycles I1
 -7.100 - 4Cycles I2
 7.200 - 4Cycles I3

Channel Name: Waveform V1
 Frequency: 60.00 Hz
 VoltageRatio: 1.000



Name	Date	Time	Duration (ms)	RMS Units
Waveform V1	04-24-2003	10:30:27.416	16.667	73.57
Waveform V1	04-24-2003	10:30:27.433	16.667	73.90
Waveform V1	04-24-2003	10:30:27.416	16.667	73.81
Waveform V2	04-24-2003	10:30:27.450	16.667	73.70
Waveform V2	04-24-2003	10:30:27.399	16.667	115.9
Waveform V2	04-24-2003	10:30:27.416	16.667	113.2
Waveform V2	04-24-2003	10:30:27.433	16.667	132.6
Waveform V3	04-24-2003	10:30:27.450	16.667	132.6
Waveform V3	04-24-2003	10:30:27.399	16.667	114.2
Waveform V3	04-24-2003	10:30:27.416	16.667	113.5
Waveform V3	04-24-2003	10:30:27.433	16.667	113.2
Waveform V3	04-24-2003	10:30:27.450	16.667	113.2

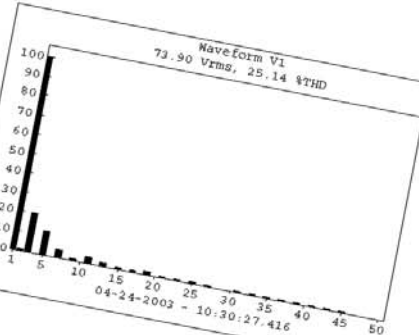
Start Date: 04-24-2003
 Start Time: 10:30:27.400
 Duration: 66.667 (ms)
 Frequency: 60.00 Hz
 Magnitude Of Transient: -137.0
 Data Point Of Transient: 28.00
 VoltageRatio: 1.000
 CurrentRatio: 1.000

Date	Time	Duration (ms)
04-24-2003	10:30:27.416	2.083
04-24-2003	10:30:27.418	2.083

04-24-2003 - 10:30:27.000
 Val: 0.000 - Transient Trigger V2



Reports can be displayed on your PC and printed. Each report includes all test results in a tabular and graphic format, as well as operator and test site information. Comments typed by the operator will also be included.



Waveform V1		
H01 (%)	H18 (%)	H35 (%)
100.0	0.1	0.6
1.2	0.1	0.5
20.5	2.0	0.8
0.3	0.1	0.4
12.4	0.7	0.9
0.4	0.2	0.4
4.2	0.8	0.4
0.4	0.2	0.2
1.3	1.1	0.2
3.7	0.3	0.8
0.1	0.9	0.6
2.2	0.3	0.1
0.2	0.4	0.9
1.6	0.7	0.1
0.3	0.3	0.5
1.4	0.9	0.1
	0.5	0.4
		0.1

Construction



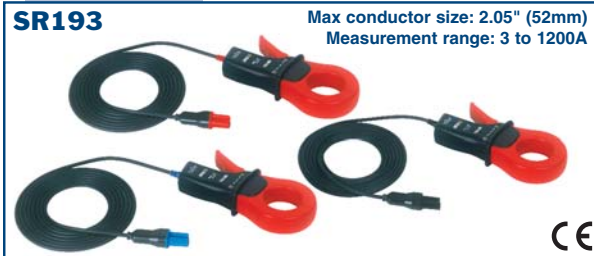
The color-coded input connectors provide dedicated current probe inputs and voltage inputs.



The connections located on the side of the Model 3945-B provide optically isolated RS-232 communication port and line power from 85 to 256VAc (50/60Hz).

Accessories

A complete family of current measurement probes to meet most AC (or DC) measurement applications up to 6500Arms.



Set of three color-coded SR193 (1200A) current probes
Catalog #2140.10 (10 ft leads); Catalog # 2124.25 (30 ft leads)



Set of three low current color-coded MN93 (240A) current probes
Catalog #2140.09 (10 ft leads); Catalog #2140.24 (30 ft leads)



Set of three color-coded AmpFlex®193-24 (6500A) flexible current probes with 24" sensors
Catalog #2140.11 (10 ft leads); Catalog #2140.26 (30 ft leads)



Set of three color-coded AmpFlex®193-36 (6500A) flexible current probes with 36" sensors
Catalog #2140.12 (10 ft leads); Catalog #2140.27 (30 ft leads)



Set of three low current color-coded MN193 (6A/120A) current probes
Catalog #2140.14 (10 ft leads); Catalog #2140.29 (30 ft leads)

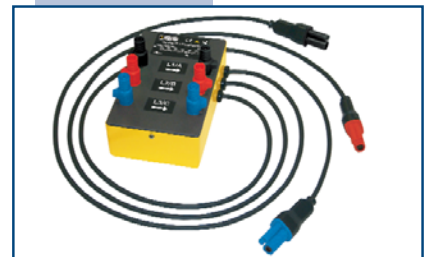


Set of three AC/DC color-coded MR193 (1000Aac/1400Adc) current probes
Catalog #2140.13 (10 ft leads); Catalog #2140.30 (30 ft leads)



MR193 probe (black connector) (1000Aac/1400Adc)
Catalog #2140.28 (10 ft leads)

The 5A Adapter Box facilitates the use of current probes with current outputs for use with PowerPad. Ratios are programmable up to 2999:1 or 2999:5. The Adapter Box works with single-, two- or three-phase current inputs.



5A Adapter Box
Catalog #2140.17



All models include three color-coded current probes (MN93 example shown), four color-coded 10 ft voltage leads, four color-coded alligator clips, RS-232 DB9F optically coupled serial cable, NiMH battery, US 120V power cord, DataView® software, carrying bag, soft carrying pouch and user manual.

ORDERING INFORMATION

CATALOG NO.

PowerPad® Model 3945-B w/MN93	Cat. #2130.75
Includes set of three color-coded 240A MN93 probes with 10 ft leads, four 10 ft color-coded voltage leads, four color-coded alligator clips, RS-232 DB9F optically coupled serial cable, NiMH battery, US 120V power cord, DataView® software, carrying bag, soft carrying pouch and user manual	
PowerPad® Model 3945-B w/SR193	Cat. #2130.76
Includes set of three color-coded 1200A SR193 probes with 10 ft leads, four 10 ft color-coded voltage leads, four color-coded alligator clips, RS-232 DB9F optically coupled serial cable, NiMH battery, US 120V power cord, DataView® software, carrying bag, soft carrying pouch and user manual	
PowerPad® Model 3945-B w/24" AmpFlex®193-24	Cat. #2130.77
Includes set of three color-coded 6500A 24" AmpFlex®193-24 probes with 10 ft leads, four 10 ft color-coded voltage leads, four color-coded alligator clips, RS-232 DB9F optically coupled serial cable, NiMH battery, US 120V power cord, DataView® software, carrying bag, soft carrying pouch and user manual	
PowerPad® Model 3945-B w/36" AmpFlex®193-36	Cat. #2130.78
Includes set of three color-coded 6500A 36" AmpFlex®193-36 probes with 10 ft leads, four 10 ft color-coded voltage leads, four color-coded alligator clips, RS-232 DB9F optically coupled serial cable, NiMH battery, US 120V power cord, DataView® software, carrying bag, soft carrying pouch and user manual	
PowerPad® Model 3945-B w/MR193	Cat. #2130.79
Includes set of three color-coded 1000A _{AC} /1400A _{DC} MR193 probes with 10 ft leads, four 10 ft color-coded voltage leads, four color-coded alligator clips, RS-232 DB9F optically coupled serial cable, NiMH battery, US 120V power cord, DataView® software, carrying bag, soft carrying pouch and user manual	
PowerPad® Model 3945-B w/MN193	Cat. #2130.80
Includes set of three color-coded 6A/120A MN193 probes with 10 ft leads, four 10 ft color-coded voltage leads, four color-coded alligator clips, RS-232 DB9F optically coupled serial cable, NiMH battery, US 120V power cord, DataView® software, carrying bag, soft carrying pouch and user manual	
Accessories (Optional)	
Set of three color-coded MN93 probes (240A) with 10 ft leads	Cat. #2140.09
Set of three color-coded SR193 probes (1200A) with 10 ft leads	Cat. #2140.10
Set of three color-coded 24" AmpFlex®193-24 probes (6500A) with 10 ft leads	Cat. #2140.11
Set of three color-coded 36" AmpFlex®193-36 probes (6500A) with 10 ft leads	Cat. #2140.12
Set of three color-coded MR193 probes (1000A _{AC} /1400A _{DC}) with 10 ft leads	Cat. #2140.13
Set of three color-coded MN193 probes (6A/120A) with 10 ft leads	Cat. #2140.14
5A Adapter box	Cat. #2140.17
Set of four color-coded 30 ft voltage leads	Cat. #2140.23
Set of three color-coded MN93-30 probes (240A) with 30 ft leads	Cat. #2140.24
Set of three color-coded SR193-30 probes (1200A) with 30 ft leads	Cat. #2140.25
Set of three color-coded 24" AmpFlex® 193-24-30 probes (6500A) with 30 ft leads	Cat. #2140.26
Set of three color-coded 36" AmpFlex® 193-36-30 probes (6500A) with 30 ft leads	Cat. #2140.27
MR193-BK probe (black connector) (1000A _{AC} /1400A _{DC})	Cat. #2140.28
Set of three color-coded MN193-30 probes (5A/100A) with 30 ft leads	Cat. #2140.29
Set of three color-coded MR193-30 probes (1000A _{AC} /1400A _{DC}) with 30 ft leads	Cat. #2140.30

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