

- 3-PHASE POWER QUALITY ANALYZER

8335

PowerPad®



IMPORTANT WARRANTY NOTE:

By registering online or returning your warranty card within 30 days from the date of purchase, your warranty will be extended to 3 years

Statement of Compliance

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met its published specifications.

An NIST traceable certificate may be requested at the time of purchase, or obtained by returning the instrument to our repair and calibration facility, for a nominal charge.

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer. For recalibration, please use our calibration services. Refer to our repair and calibration section at www.aemc.com.

Serial #: _____

Catalog #: _____

Model #: 8335

Please fill in the appropriate date as indicated:

Date Received: _____

Date Calibration Due: _____



Chauvin Arnoux®, Inc.
d.b.a AEMC® Instruments
www.aemc.com



READ CAREFULLY BEFORE USING FOR THE FIRST TIME

Your instrument is equipped with a NiMH battery. This technology offers several advantages:

- **Long battery charge life for a limited volume and weight.**
- **Possibility of quickly recharging your battery.**
- **Significantly reduced memory effect: you can recharge your battery even if it is not fully discharged.**
- **Respect for the environment: no pollutant materials such as lead or cadmium, in compliance with the applicable regulations.**

After prolonged storage, the battery may be completely discharged. If so, it must be completely recharged.

Your instrument may not function during part of this recharging operation.

Full recharging of a completely discharged battery may take several hours.



NOTE: In this case, at least 5 charge/discharge cycles will be necessary for your battery to recover 95% of its capacity.

To make the best possible use of your battery and extend its effective service life:

- **Only use the charger supplied with your instrument. Use of another charger may be dangerous.**
- **Only charge your instrument at temperatures between 0° and 40°C.**
- **Comply with the conditions of use defined in the operating manual.**
- **Comply with the storage conditions specified in the operating manual.**

NiMH technology allows a limited number of charge/discharge cycles depending significantly on:

- **The conditions of use.**
- **The charging conditions.**



Do not dispose of the battery pack with other solid waste. Used batteries must be entrusted to a qualified recycling company or to a company specialized in processing hazardous materials.

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INTRODUCTION













Warning

These precautions for use are imperative when using the machine. Failure to comply with these instructions may lead to electric shocks, explosions or fire.

- The operator will consult these instructions whenever the  symbol is displayed.
- If you use this instrument in a way which is not specified, the protection which it provides may be compromised, putting you in danger.
- When removing or inserting the battery and/or SD card, ensure that the measuring leads, sensors and power cord are disconnected. The unit must be disconnected and powered down.
- The unit must not be used if the “battery/SD card” housing is absent, damaged or incorrectly fitted.
- The safety of any system incorporating this instrument is the responsibility of the system assembler.
- For your safety, only use the leads and suitable accessories delivered with the instrument: they comply with the norm IEC 61010-031 (2002). When the sensors or accessories of lower voltage and/or category are connected to the unit, these lower voltages and/or categories become applicable to the entire set.
- Before using the PowerPad[®] always check that the leads, sensors and accessories are in perfect condition. If anything appears damaged (even partially) it must be repaired or scrapped.
- Comply with the specified environmental conditions.
- It is advisable to use individual protective safety devices when the environment in which the unit is used require them.
- This unit must be used for CAT IV installations, for voltages that do not exceed 600V_{AC/DC} in relation to the ground (per IEC standard 61010-1) or for voltages that do not exceed 1000V for CAT III installations. Never use voltage networks or categories greater than those mentioned.
- Only use power cords and battery packs supplied by the manufacturer. They have specific security mechanisms.
- Comply with the limits of the accessory or sensor safety mechanisms. Do not keep hands close to unused terminals.
- Certain current sensors cannot be inserted and removed from bare conductors under a dangerous voltage: consult the sensor’s manual and comply with handling instructions.

1.1 International Electrical Symbols

	Signifies that the instrument is protected by double or reinforced insulation.
	CAUTION - DANGER! Read the User Manual.
	Risk of electric shock. The voltage at the parts marked with this symbol may be dangerous.
	Refers to a type A current sensor. This symbol signifies that application around and removal from HAZARDOUS LIVE conductors is permitted.
	Refers to a type B current sensor. Do not apply around or remove from HAZARDOUS LIVE conductors without additional protective means (de-energizing the circuit or wearing protective clothing suitable for high voltage work).
	Important instructions to read and understand completely.
	Important information to acknowledge.
	USB socket
	The CE marking guarantees conformity with European directives and with regulations covering EMC.
	The trash can with a line through it means that in the European Union, the product must undergo selective disposal for the recycling of electric and electronic material, in compliance with Directive WEEE 2002/96/EC.

1.2 Definition of Measurement Categories

- CAT I:** Measurement category I corresponds to measurements taken on circuits not directly connected to the network.
- CAT II:** Measurement category II corresponds to measurements taken on circuits directly connected to the installation.
Example: measurement for electrodomestic units, portable tools and analogue devices
- CAT III:** Measurement category III corresponds to measurements on building installations.
Example: measurement on distribution panels, cabling, etc.
- CAT IV:** Measurement category IV corresponds to measurements taken at the source of low-voltage installations
Example: metering and measurements on overvoltage protection devices.

1.3 Receiving Your Shipment



NOTE: After receiving your PowerPad®, charge and discharge the instrument one or two cycles to ensure the proper level display of the battery indicator.

Make sure the contents shipped are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears damaged, file a claim immediately with the carrier and notify your distributor at once. Save the damaged packing container to substantiate your claim. Do not use equipment which is damaged or appears to be damaged.

1.4 Ordering Information

PowerPad® Model 8335 Cat. #2136.20

Includes five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.

PowerPad® Model 8335 w/4 MN93-BK Cat. #2136.21

Includes the PowerPad® Model 8335, four MN93-BK (240A) probes, five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.

PowerPad® Model 8335 w/4 SR193-BK Cat. #2136.22

Includes the PowerPad® Model 8335, four SR193-BK (1200A) probes, five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.

PowerPad® Model 8335 w/4 AmpFlex® 193-24-BK (24") Cat. #2136.23

Includes the PowerPad® Model 8335, four 24" AmpFlex® 193-24-BK (6500A) sensors, five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.

PowerPad® Model 8335 w/4 AmpFlex® 193-36 (36") Cat. #2136.24

Includes the PowerPad® Model 8335, four 36" AmpFlex® 193-36-BK (6500A) sensors, five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.

PowerPad® Model 8335 w/4 MR193-BK Cat. #2136.25

Includes the PowerPad® Model 8335, four MR193-BK (1000AAC/1400ADC) probes, five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.

PowerPad® Model 8335 w/4 MN193-BK Cat. #2136.26
Includes the PowerPad® Model 8335, set of four MN193-BK (6A/120A) probes, five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.

PowerPad® Model 8335 w/4 MA193-10-BK Cat. #2136.27
Includes the PowerPad® Model 8335, set of four MA193-10-BK (1000A) probes, five 10 ft black voltage leads, five black alligator clips, twelve color-coded input ID markers, USB cable, NiMH battery, 110/240V power adapter with US power cord, DataView® software, extra large classic tool bag, soft carrying pouch and user manual.



Only the SR, Ampflex® and MiniFlex® sensors are rated 600V CAT IV
The MN and MR probes are 300V CAT IV, 600V CAT III

1.4.1 Accessories and Replacement Parts

Extra Large Classic Tool Bag	Cat. #2133.73
Replacement - Soft Carrying Pouch	Cat. #2140.15
5A Adapter Box (consult factory)	Cat. #2140.17
Replacement - Battery 9.6V NiMH	Cat. #2140.19
AC Current Probe Model MR193-BK (1000Aac/1400Adc)	Cat. #2140.28
AC Current Probe Model MN93-BK (200A)	Cat. #2140.32
AC Current Probe Model SR193-BK (1200A)	Cat. #2140.33
AmpFlex® Sensor 24" Model 193-24-BK (6500A)	Cat. #2140.34
AmpFlex® Sensor 36" Model 193-36-BK (6500A)	Cat. #2140.35
AC Current Probe Model MN193-BK (5A/100A)	Cat. #2140.36
MiniFlex® Sensor 10" Model MA193-10-BK (1000A)	Cat. #2140.48
Replacement - Set of 5, 10 ft (3m) black leads with 5 black alligator clips	Cat. #2140.43
Lead - 1, 10 ft (3m) black lead with black alligator clip	Cat. #2140.44
Replacement - Set of 12, Color-coded Input ID Markers	Cat. #2140.45
Replacement - 6 ft USB cable	Cat. #2140.46
Replacement - 110/240V Power Adapter with US Power Cord	Cat. #5000.19

DataView® Software Updates are available Online

PRODUCT FEATURES

2.1 Description

The easy-to-use, compact and shock-resistant PowerPad® Model 8335 is a three-phase power quality analyzer equipped with four current probes and five voltage inputs. It is intended for technicians and engineers to measure and carry out diagnostic work and power quality work on one, two or three phase low voltage networks.

The PowerPad's 2GB 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 50 screen snapshots, up to 210 captured transients that contain four cycles for each active input, and 10,000 alarm events from up to 40 different parameters. 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 including phase unbalance.

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

Transients or Inrush Current – Set, capture and display transients. You select the threshold and the number of transients to capture. The PowerPad® then captures four waveforms for each transient; the triggering waveform as well as one pre-triggered and two post-triggered waveforms. As many as 210 transients each consisting of 4 waveforms per channel for up to 8 channels can be captured.

Trend Recording – Record and display trend data at user selectable sample rates from 1/sec to 1/15 minutes and user programmable recording periods into 2GB of memory.



Recordings can only be downloaded through the USB port. Extremely long recordings will take a long time to download (> 2H per 100MB). Also, keep in mind that Microsoft® Excel is limited to 10,000 lines per spreadsheet and Access has limitations as well.

2.2 Key Features

- Measurement of TRMS voltages up to 1000Vrms AC/DC for two, three, four or five-wire systems
- Measurement of TRMS currents up to 6500Arms (sensor dependent)
- Measurement of DC current up to 1400A_{DC} (with MR193 probe)
- Automatic probe detection and calibration
- Frequency measurement (40 to 69Hz systems)
- Direct measurement of neutral current for WYE configurations
- Record and display trend data as fast as once per second for one month for up to 25 variables. It is recommended to limit recordings to under 100MB.
- Energy assessments
- Transient detection on all V and I inputs
- Inrush current
- Calculation of Crest Factors for current and voltage
- Calculation of the K Factor for transformers
- Calculation of short-term flicker for voltage
- Calculation of the phase unbalance for voltage and current (3 phase only)
- Measurement of harmonic angles and rates (referenced to the fundamental or RMS value) for voltage, current or power, up to 50th harmonic
- Display of harmonic sequencing and direction
- Calculation of overall harmonic distortion factors
- Real time display of Phasor diagrams including values and phase angles
- Monitoring of the average value of any parameter, calculated over a period running from 1 sec to 2 hrs
- Measurement of active, reactive and apparent power per phase and their respective sum total
- Calculation of power factor, displacement power factor and tangent factor
- Total power from a point in time, chosen by the operator
- Recording, time stamping and characterization of disturbance (swells, sags and interruptions, exceedance of power and harmonic thresholds)
- Detection of transients and recording of associated waveforms.
- Color-coded input ID markers to identify voltage and current inputs to local standards.
- 2GB internal memory
- DataView® software included for downloading measurements, storage, and analysis and report generation.

2.3 Control Functions

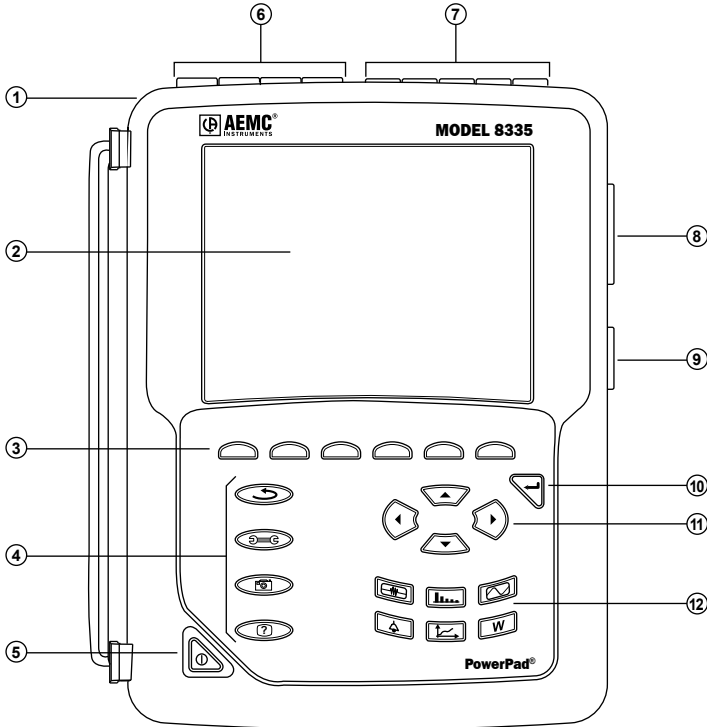






Figure 2-1

- ① Over molded protective case.
- ② Color LCD display with graphic representation of system parameters and measurements (see § 2.4)
- ③ Six (6) function buttons used to modify the display mode.
- ④ Four (4) function buttons which allow the user to:
 -  Return to the choice of measurement view.
 -  Configure the PowerPad® (SET-UP)
 -  Take a snapshot of the current screen or access screens already stored in the memory. Record associated waveform and power measurement data.
 -  Get help on the current display functions, in the language chosen by the user.
- ⑤ ON / OFF button.
- ⑥ Four (4) current inputs on the top of the instrument to enable the use of current sensors (MN, SR, AmpFlex®, MiniFlex®, and MR probes).

- ⑦ Five (5) voltage inputs.
- ⑧ USB optically isolated output for configuring, running tests and transferring data to a PC.
- ⑨ Input for external power supply.
- ⑩ Enter button.
- ⑪ Four (4) buttons that enable movement of the cursor, browsing or the selection of data.
- ⑫ Buttons for directly accessing the 6 display modes (see § 2.5):

2.4 Display

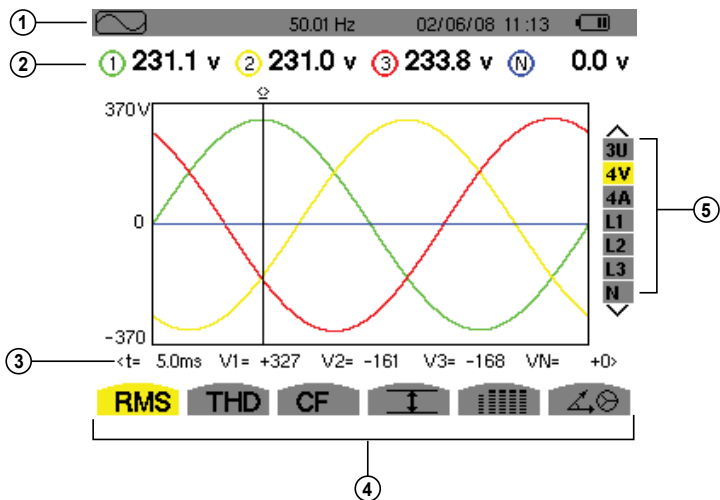




Figure 2-2

- ① Top display bar indicates:
 - Symbol of the tested mode (e.g. , , **W**, etc)
 - Frequency of measured signal
 - Memory capacity status bar (only available in certain modes)
 - Current date and time
 - Battery charge status (see § 8)
- ② Measured RMS values associated with waveforms.
- ③ Values of signals at an instant “t”, at the intersection of cursor and the waveforms. The cursor can be moved along the time scale by pressing the ◀ and ▶ buttons.

④ Measurement selection (refer to chart below)



Calculation of DPF, Tan, KF, Φ , UNB, Min, Max, VAR, Harmonics, PST, and DF parameters and the frequency measurement can only be performed if voltage or current with a frequency of 41 to 70Hz is applied to the Ch1 voltage input or the A1 current input.

⑤ Selection of waveforms to be displayed (use the ▲ and ▼ buttons to select):










U: Signifies phase-to-phase voltage

V: Signifies phase-to-neutral voltage







A: Displays V and A for each phase

L1, L2, L3: Refer to the phases (A,B,C)

Icon	Description
RMS	True RMS Measurement
THD	Total Harmonic Distortion
CF	Crest Factor
	Display of current values and their extremes
	Display all voltage and current measurements simultaneously (RMS, DC, THD, CF, PST, KF, DF)
	Fresnel diagram
V	Single voltage mode
A	Simple current mode
VA	Power mode
U	Voltage mode (phase-to-phase)
	Zoom in
	Zoom out
<>	Left/right key prompt
^ v	Up/down key prompt
PF...	Display of PF, DPF and Tan.
W...	Active power.
	Recording mode
	Recording display and selection mode
OK	Validation prompt
	Shutdown function in progress prompt
	Display of energy consumed
	Display of energy generated

	Screen 1 of the help function
	Screen 2 of the help function
	Screen 1 of the selected recording parameter
	Screen 2 of the selected recording parameter
	Screen 3 of the selected recording parameter
	Screen 4 of the selected recording parameter
	Following page screen
	Previous page screen
	Trash for deleted or removed elements

2.5 Button Functions

Icon	Description
	Transients or Inrush Current: <ul style="list-style-type: none"> set and view transient and inrush current waveforms associated with rapid changes in input
	Harmonics Mode: <ul style="list-style-type: none"> display of the harmonics in percent and value ratios for voltage, current and power, for each harmonic through the 50th determination of harmonic current produced by non-linear loads analysis of the problems caused by harmonics according to their order (heating of neutrals, conductors, motors, etc.)
	Waveforms Mode: <ul style="list-style-type: none"> displays voltage and current waveforms or vector representation identification of signal distortion signatures display of amplitude and phase unbalance for voltage and current checking connections for correct phase order
	Alarm Events: <ul style="list-style-type: none"> provides a list of the alarms recorded according to the thresholds programmed during configuration logging of interruption with half-cycle resolution determination of energy consumption exceedances stores value, duration, date, time and set point for up to 4096 events
	Trend Mode: <ul style="list-style-type: none"> records measured and calculated values (Urms, Vrms, Arms, etc.)
	Power / Energy: <ul style="list-style-type: none"> display of power levels and the associated parameters (power factor, displacement and tangent) energy monitoring four quadrant measurement to discern produced/consumed active energies and inductive/capacitive reactive energies

SPECIFICATIONS

3.1 Reference Conditions

Parameter	Reference Conditions
Ambient temperature	73°F ± 5°F (23°C ± 3°C)
Humidity	45% to 75%
Atmospheric pressure	25.4" Hg to 31.3" Hg (860 to 1060 hPa)
Phase voltage	50Vrms to 1000Vrms without DC (<0.5%)
Clamp current circuit input voltage	30mVrms to 1Vrms without DC (<0.5%)
AmpFlex® current circuit input voltage	11.73mVrms to 117.3mVrms without DC (<0.5%)
Frequency of electricity network	50 and 60Hz ± 0.1Hz
V/I phase shift	0° active power / 90° reactive power
Harmonics	<0.1%
Voltage unbalance	<10%



NOTE: The symbol “U” will be used throughout this manual and in the instrument to refer to phase-to-phase voltage measurement.

The symbol “V” will be used for phase-to-neutral voltage measurement.

**Specifications are subject to change without notice.*

3.2 Electrical Specifications

Sampling Frequency (256 samples per cycle):

12.8kHz samples/sec per channel @ 50Hz

15.36kHz samples/sec per channel @ 60Hz

Waveforms: Displays voltages and currents

Screen captures: 50 max

Transients: Detection and recording of transients (up to 210)

Inrush Current: Detection and recording of Inrush current (1 max)

Memory: 2GB with date and time programming

Alarm Function: 10,000 alarms max

3.2.1 Voltage Inputs

Operating Range: Phase-Phase - 2000Vrms AC/DC
Phase-Neutral - 1000Vrms AC/DC

Input Impedance: 969kΩ between phase and neutral and neutral and ground

Overload: 1.2Vn permanently; 2Vn for 1 sec (Vn = nominal voltage)

3.2.2 Current Inputs

Operating Range: 0 to 1V

Input Impedance: 1MΩ for current probe circuit and 12.4kΩ for AmpFlex® circuit

Overload: 1.7V

3.2.3 Accuracy Specifications (excluding current probes)

Function		Measurement Range		Resolution	Accuracy
		Minimum	Maximum		
Frequency		40Hz	69Hz	0.01Hz	±(1ct)
Phase Voltage TRMS		10V	1000V ⁽¹⁾	0.1V V < 1000V	±(0.5% + 2cts)
				1V V ≥ 1000V	±(0.5% + 1ct)
Composite Voltage TRMS		10V	2000V ⁽²⁾	0.1V V < 1000V	±(0.5% + 2cts)
				1V V ≥ 1000V	±(0.5% + 1ct)
DC Voltage		10V	1000V	0.1V V < 1000V	±(1% + 5cts)
				1V V ≥ 1000V	±(1% + 1ct)
Current TRMS	Excluding AmpFlex® & MiniFlex®	I _{nom} ÷ 1000 [A]	1.2 × I _{nom} [A]	0.1A I < 1000A	±(0.5% + 2cts)
				1A I ≥ 1000A	±(0.5% + 1ct)
	AmpFlex® & MiniFlex®	10A	6500A	0.1A I < 1000A	±(0.5% + 1A)
				1A I ≥ 1000A	
Direct Current (DC)		1A	1200A ⁽³⁾	0.1A I < 1000A	±(1% + 1A)
				1A I ≥ 1000A	

Function		Measurement Range		Resolution	Accuracy
		Minimum	Maximum		
Peak Current	Excluding AmpFlex® & MiniFlex®	$I_{nom} \div 1000$ [A]	$1.7 \times I_{nom}$ [A] ⁽⁴⁾	0.1A $I < 1000A$	$\pm(1\% + 1A)$
	AmpFlex® & MiniFlex®	10A	9190A ⁽⁵⁾	1A $I \geq 1000A$	
Half-period TRMS Current ⁽⁷⁾	Excluding AmpFlex® & MiniFlex®	$I_{nom} \div 100$ [A]	$1.2 \times I_{nom}$ [A]	0.1A $I < 1000A$ 1A $I \geq 1000A$	$\pm(1\% + 1A)$
	AmpFlex® & MiniFlex®	100A	6500A	0.1A $I < 1000A$ 1A $I \geq 1000A$	$\pm(1.5\% + 4A)$
				0.1V $V < 1000V$ 1V $V \geq 1000V$	
Peak Phase Voltage	10V	1414V ⁽⁶⁾	0.1V $V < 1000V$ 1V $V \geq 1000V$	$\pm(1\% + 1V)$	
Peak Composite Voltage	10V	2828V ⁽⁷⁾	0.1V $U < 1000V$ 1V $U \geq 1000V$	$\pm(1\% + 1V)$	

(1) In 1000V_{RMS}, CAT III, providing that voltage between each of the terminals and ground does not exceed 1000V_{RMS}.

(2) Two phase (opposite phases) – same note as (1).

(3) Limitation of the MR clamp.

$$(4) 1.2 \times I_{nom} \times \sqrt{2} = 1.7 \times I_{nom} \quad (6) 1000 \times \sqrt{2} = 1414$$

$$(5) 6500 \times \sqrt{2} = 9190 \quad (7) 2000 \times \sqrt{2} = 2828$$

Function		Measurement Range		Resolution	Accuracy
		Minimum	Maximum		
Phase Voltage TRMS Half-period ⁽³⁾		10V	1000V ⁽¹⁾	0.1V V < 1000V	±(0.8% + 1V)
				1V V ≥ 1000V	
Composite Voltage TRMS Half-period ⁽³⁾		10V	2000V ⁽²⁾	0.1V U < 1000V	±(0.8% + 1V)
				1V U ≥ 1000V	
Peak Factor		1	3.99	0.01	±(1% + 2cts)
		4	9.99	0.01	±(5% + 2cts)
Active Power	Excluding AmpFlex® & MiniFlex®	0Ω	9999kW	1V U ≥ 1000V	±(1%) Cos φ ≥ 0.8 ±(1.5% + 10cts) 0.2 ≤ Cos φ < 0.8
	AmpFlex® & MiniFlex®	0Ω	9999kW	4 digits	±(1%) Cos φ ≥ 0.8 ±(1.5% + 10cts) 0.5 ≤ Cos φ < 0.8
Reactive Powers Inductive & Capacitive	Excluding AmpFlex® & MiniFlex®	0VAR	9999kVAR	4 digits	±(1%) Sin φ ≥ 0.5 ±(1.5% + 10cts) 0.2 ≤ Sin φ < 0.5
	AmpFlex® & MiniFlex®	0VAR	9999kVAR	4 digits	±(1.5%) Sin φ ≥ 0.5 ±(2.5% + 20cts) 0.2 ≤ Sin φ < 0.5
Apparent Power		0VA	9999kVA	4 digits	±(1%)
Power Factor		-1	1	0.001	±(1.5%) Cos φ ≥ 0.5
					±(1.5% + 10cts) 0.2 ≤ Cos φ < 0.5

(1) In 1000V_{RMS}, CAT III, providing that voltage between each of the terminals and ground does not exceed 1000V_{RMS}.

(2) Two phase (opposite phases) – same note as (1).

(3) **Caution:** The absolute value of offset must not exceed 95% of peak amplitude.

In other words, $s(t) = S \times \sin(\omega t) + O$, we have $|O| \leq 0.95 \times S$ (with positive S).

MAX and MIN values in wave shape mode and the values V_{RMS} and A_{RMS} (excluding neutral channels) in Alarm and Inrush current modes are half-period values.

NOTE: The uncertainties given for power and energy measurements are maximum for |Cos φ| = 1 or |Sin φ| = 1 and are typical for other phase displacement values.

Function		Measurement Range		Resolution	Accuracy
		Minimum	Maximum		
Active Energy	Excluding AmpFlex® & MiniFlex®	0Wh	9999MWh	4 digits	±(1%) Cos $\phi \geq 0.8$
					±(1.5%) 0.2 ≤ Cos $\phi < 0.8$
	AmpFlex® & MiniFlex®	0Wh	9999MWh	4 digits	±(1%) Cos $\phi \geq 0.8$
					±(1.5%) 0.5 ≤ Cos $\phi < 0.8$
Reactive Energies	Excluding AmpFlex® & MiniFlex®	0VARh	9999MVARh	4 digits	±(1%) Sin $\phi \geq 0.5$
					±(1.5%) 0.2 ≤ Sin $\phi < 0.5$
Inductive & Capacitive	AmpFlex® & MiniFlex®	0VARh	9999MVARh	4 digits	±(1.5%) Sin $\phi \geq 0.5$
					±(2.5%) 0.2 ≤ Sin $\phi < 0.5$
Apparent Energy		0VAh	9999MVAh	4 digits	±(1%)
Dephasing		-179°	180°	1°	±(2°)
Tangent VA ≥ 50VA		-32.76	32.76	0.001	±(1°) for ϕ
				Tan $\phi < 10$	
				0.01 Tan $\phi \geq 10$	
Displacement factor (DPF)		-1	1	0.001	±(1°) for ϕ & ±(5cts) for DPF
Harmonic rates ∈ [1; 50] (Vrms > 50V)		0%	999.9%	0.1%	±(1% + 5cts)
Excluding AmpFlex® & MiniFlex® (Irms > 3 × Inom ÷ 100)					
AmpFlex® & MiniFlex® (Irms > Inom ÷ 10)					
Harmonic angles (Vrms > 50V)		-179°	180°	1°	±(3°) ∈ [1; 25]
Excluding AmpFlex® & MiniFlex® (Irms > 3 × Inom ÷ 100)					
AmpFlex® & MiniFlex® (Irms > Inom ÷ 10)					
Global Harmonic Rate (THD or THD-F) rank ≤ 50		0%	999.9%	0.1%	±(1% + 5cts)
Distorsion Factor (DF or THD-R) ≤ 50		0%	999.9%	0.1%	±(1% + 10cts)

Function	Measurement Range		Resolution	Accuracy
	Minimum	Maximum		
Factor K	1	99.99	0.01	±(5%)
Unbalance (three phase network)	0%	100%	0.1%	±(1%)

3.2.4 Current Probe Accuracy (to be added to the PowerPad®'s accuracy)

Sensor Type	TRMS Current	Accuracy on IRMS	Accuracy on ϕ
MR193 1000A	[1A; 10A]	±(1.5% + 1A)	N.S.
	[10A; 100A]		±(2°)
	[100A; 800A]	±(3%)	±(1.5°)
	[800A; 1200A]	±(5%)	
	[1200A; 1400A]		
SR193 1000A	[1A; 3A]	±(0.8%)	N.S.
	[3A; 10A]		±(1°)
	[10A; 100A]	±(0.3%)	±(0.5°)
	[100A; 1200A]	±(0.2%)	±(0.3°)
AmpFlex® 3000A	[10A; 100A]	±(3%)	±(1°)
	[100A; 6500A]	±(2%)	±(0.5°)
MiniFlex® 1000A	[10A; 100A]	±(3%)	±(1°)
	[100A; 1000A]	±(2%)	±(0.5°)
MN93 200A	[0.5A; 2A]	±(3% + 1A)	N.S.
	[2A; 10A]		±(6°)
	[10A; 100A]	±(2.5% + 1A)	±(3°)
	[100A; 240A]	±(1% + 1A)	±(2°)
MN193 100A	[100mA; 300mA]	±(0.7% + 2mA)	N.S.
	[300mA; 1A]		±(1.5°)
	[1A; 120A]	±(0.7%)	±(0.7°)
MN193 5A	[5mA; 50mA]	±(1% + 0.1mA)	±(1.7°)
	[50mA; 500mA]	±(1%)	±(1°)
	[500mA; 6A]	±(0.7%)	
5A Adapter	[5mA; 50mA]	±(1%)	±(1°)
	[50mA; 6A]	±(0.5%)	±(0°)

N.S. = Not Specified

3.2.5 Current Probes and Sensors

When installing probes, face the arrow on the probe in the direction of the load.

Model SR193	
Nominal Range	1000AAC for $f \leq 1$ kHz
Measurement Range	1A to 1200AAC max ($I > 1000$ A not continuously)
Probe Output Signal	1 mVAC/AAC
Maximum Clamping Diameter	2" (52mm)
Safety	EN 61010-2-032, Pollution Degree 2, 600V CAT IV, 1000V CAT III

NOTE: Currents < 0.5 A will be displayed as zero. Neutral current measures down to 0A.

Model MN93	
Nominal Range	200AAC for $f \leq 1$ kHz
Measurement Range	2A to 240AAC max ($I > 200$ A not permanent)
Probe Output Signal	5mVAC/AAC
Maximum Clamping Diameter	0.8" (20mm)
Safety	EN 61010-2-032, Pollution Degree 2, 300V CAT IV, 600V CAT III

NOTE: Currents < 0.5 A will be displayed as zero. Neutral current measures down to 0A.

Model MR193	
Nominal Range	1000AAC, 1400ADC max
Measurement Range	10A to 1000AAC, 10A to 1300APEAK AC+DC
Probe Output Signal	1 mV/A
Maximum Clamping Diameter	One 1.6" (42mm) or two 0.98" (25.4mm) or two bus bars 1.96 x 0.19" (50 x 5mm)
Safety	EN 61010-2-032, Pollution Degree 2, 300V CAT IV, 600V CAT III

NOTE: Currents < 1 AAC/DC will be displayed as zero. Neutral current measures down to 0A.

Model MN193	
Nominal Range	5A and 100AAC
Measurement Range	5A: 0.005A to 6AAC max (1A to 1200A with ratio 1000/5 selected) 100A: 0.1A to 120AAC max
Probe Output Signal	5A: 200mV/AAC; 100A: 10mV/AAC
Maximum Clamping Diameter	0.8" (20mm)
Safety	EN 61010-2-032, Pollution Degree 2, 300V CAT IV, 600V CAT III

The 5A range of the MN193 is designed to work with secondary current transformers. Best accuracy is available when entering the transformer ratio (e.g. 1000/5A). When used to measure 5A direct, the resolution will be limited to 0.1A max.

NOTE: Currents $< (\text{Primary} \times 5) \div (\text{Secondary} \times 1000)$ or < 250 mA on the 5A range and < 0.2 A on the 100A range will be displayed as zero with this probe. Power calculations will also be zeroed when the current is zeroed when the current is zeroed.

AmpFlex® Sensors	
Nominal Range	3000AAC
Measurement Range	10A to 6500AAC
Probe Output Signal*	140mVAC/3000AAC at 60Hz
Sensor	Length = 24" (610mm); Ø = 7.64" (190mm) Length = 36" (910mm); Ø = 11.46" (290mm)
Safety	EN 61010-2-032, Pollution Degree 2, 600V CAT IV, 1000V CAT III

*Output is proportional to the amplitude and frequency of the measured current.

NOTE: Currents <10A will be displayed as zero. Neutral current measures down to 0A.

MiniFlex® Sensors	
Nominal Range	1000AAC
Measurement Range	10A to 1000AAC
Probe Output Signal*	47µVAC/1000AAC at 60Hz
Sensor	Length = 10" (250mm); Ø = 2.75" (70mm)
Safety	EN 61010-2-032, Pollution Degree 2, 600V CAT IV, 1000V CAT III

*Output is proportional to the amplitude and frequency of the measured current.

NOTE: Currents <10A will be displayed as zero. Neutral current measures down to 0A.

3.2.6 Power Supply

AC Power (external power supply)

Operating Range: 230VAC ± 10% @ 50Hz and 120VAC ± 10% @ 60Hz

Max Power: 40VA

Battery Power (allows use in the event of an interruption)

Type: NiMH 4000mAh min

Rated Voltage: 9.6V

Charge Time: 5 hrs approx

Battery Life: 10 hrs (completely charged) approx
35 hrs (recording in progress) approx

Operating Temperature: 32° to 122°F (0° to 50°C)

Recharging Temperature: 50° to 104°F (10° to 40°C)

Storage Temperature: -4 to +122°F (-20 to +50°C) for ≤ 30 days



When the charger is connected, the battery starts to charge and the ON/OFF button will stay illuminated. Once the battery is charged, the instrument uses the current supplied by the power supply, without drawing from the battery.

3.3 Mechanical Specifications

Dimensions: 7.9 x 9.8 x 2.6" (200 x 250 x 67mm)

Weight: 4.3 lb (1950g) with batteries

Shock and Vibration: per EN 61010-1

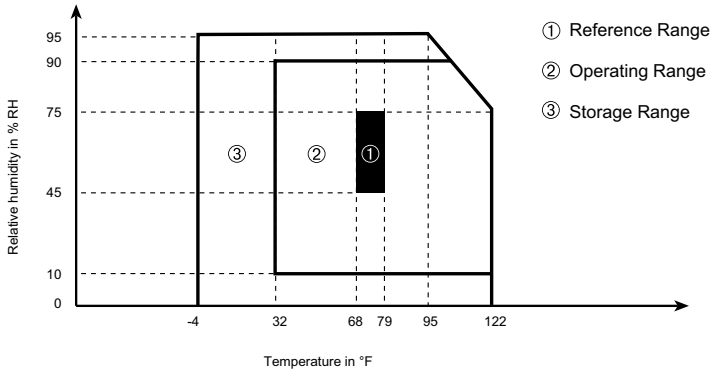
Tightness: IP 50 per EN 60529 (*electrical IP2X for terminals*)

3.4 Environmental Specifications

Altitude: Operating: 0 to 2000 meters (6560 ft)

Non-Operating: 0 to 10,000 meters (32800 ft)

Temperature and % RH:



3.5 Safety Specifications

Electrical Safety



EN 61010-1; 600V CAT IV* (probe dependent); Pollution Degree 2

Indoor Use

***Warning:** The assigned voltage and measuring category of the “device + current probe” may differ from the characteristics of the device alone.

- The use of the AmpFlex®, MiniFlex® and SR probes rate the “device + probe” at **600V CAT IV** or **1000V CAT III**.
- The use of the MR193, MN93 and MN193 probes rate the “device + current probe” at **300V CAT IV** or **600V CAT III**.
- The use of the 5A adapter rates the “device + current probe” at **150V CAT IV** or **300V CAT III**.

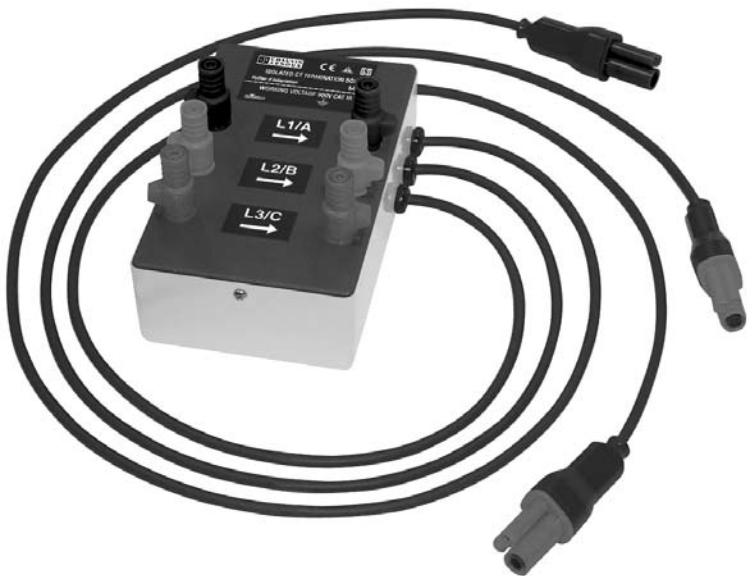
Electromagnetic Compatibility

Immunity: EN 61326-1+A3

- Resistance to electrostatic discharges (EN 61000-4-2)
 - 1st level : Gravity - 4 kV in contact
Sanctions - CRITERION A
 - 2nd level : Gravity - 8 kV in the air
Sanctions - CRITERION A
- Resistance to radiation (per EN 61000-4-3 and EN 61000-4-8)
 - Gravity: 10 V.m⁻¹
 - Sanctions: CRITERION B (THD_A altered on Rogowsky chain)
- Resistance to rapid transient bursts (EN 61000-4-4)
- Resistance to electric shocks (per EN 61000-4-5)
- Conducted RF interference (per EN 61000-4-6)
- Voltage interruption (per EN 61000-4-11)

3.6 Three-phase 5A Adapter Box

(3-Channel Use Only)



This adapter is a three-phase adapter with three 5AAC inputs L1, L2, L3 and three AC voltage outputs. All circuits are independent and isolated between input and output. The outputs are equipped with connectors to mate with the PowerPad[®] current channel inputs.

It facilitates automatic sensor recognition and probe ratio programming for both 1 Amp and 5 Amp output probes. Additionally, the adapter box can be used directly in series in a 5 Amp circuit.



WARNING: This adapter is rated EN 61010, **300V, CAT III** and permits the use of standard current probes with either a 1 Amp or 5 Amp output.

The input connections accept either Ø 4mm male plugs or rigid leads between 1 and 2.5mm² inserted in the side hole after pressing the spring loaded connector down to expose the hole.

3.6.1 Connecting to Secondary Current Transformer (CT)



WARNING: Use caution when connecting to a secondary current transformer.

1. Short the two leads of each secondary current measurement transformer.
2. Never open a secondary circuit of a CT if its primary circuit is connected to a supply voltage. In any case, disconnect the primary measurement transformer circuit from the supply network.
3. Connect each CT secondary to the input of the 5A adapter in the correct order (ground on P2) and the right phase order L1, L2, L3.

3.6.2 Specifications (add PowerPad® accuracy $\pm 0.5\% \pm 1 \text{ ct}$)

Note: Currents $< (\text{Primary} \times 5) \div (\text{Secondary} \times 1000)$ will be displayed as zero on the PowerPad® with this probe

Range:	5A
Output / Input Ratio:	0.2mV/mAAC
Dimensions:	6.00 x 3.74 x 3.38" (153 x 95 x 86mm)
Weight:	1.98 lbs (900g)
Impermeability:	IP50 per EN 60529 (electrical IP2X for the terminals)
Electrical safety:	Double Insulation, 300V Cat. III Pollution Degree 2 per IEC 61010-1
Operating Temperature:	5° to 131°F (-15° to 55°C), 0 to 90% RH
Storage Temperature:	-40° to 185°F (-40° to 85°C), 0 to 90% RH
Reference Conditions:	73°F (23°C) $\pm 3\text{K}$, 50 to 85% RH, 50/60Hz $\pm 2\text{Hz}$

Current measurement according to IEC 44-1 Class 0.5

Range	5mA to 50mA	50mA to 1A	1A to 6A
Error %	0.35% + 1.5mA	0.25% + 1mA	0.25% + 0.5mA
Phase Error	0.5°	0.4°	0.33°

Primary Voltage Loss: < 0.3V

Permanent Overload: 10A

Temperature Influence: < 0.1% par 25K

Frequency Influence	65Hz to 500Hz	500Hz to 1kHz	1kHz to 5kHz
Error	0.1%	0.3%	0.5%
Phase error	0.1°	0.2°	1°


OPERATION

4.1 Getting Started



NOTE: Make sure the PowerPad® is fully charged before use.

Connecting:

- Start the instrument by pressing the  button.
- Configure the unit to obtain the required results and type of network (see § 4.3).
- Connect the current leads and sensors to the PowerPad®.
- Connect the ground and/or neutral lead to the network ground and/or neutral (when distributed), as well as the corresponding current sensor.
- Connect the L1 phase lead to the network L1 phase, as well as the corresponding current sensor
- Repeat the procedure for phases L2, L3 and N

Note: Complying with this procedure limits connection errors to a minimum and conserves time.

Disconnecting:

- Proceed in the reverse order to connecting, always finishing by disconnecting the ground and/or neutral (when distributed)
- Disconnect the unit leads and power it down.
- Recharge the battery and recover the data registered where necessary.
- USB sockets can be used to connect the unit to any type of network.

The following precautions for use must be complied with:

- Do not connect any voltages exceeding 1000Vrms in relation to the ground/earth.
- When connecting and disconnecting the batteries, check that measuring leads are disconnected.

If there is no AC power adapter, the instrument operates on batteries. The instrument's batteries are charged when it is connected to a 120/240; 60/50Hz line.



The current probes connected are identified every second. The scaling will automatically reset when a new set of probes is connected. Use the same probe type for each phase. When installing probes, face the arrow on the probe in the direction of the load. For the MN193 and 5A Box, the ratio needs to be programmed from the instrument menu or software.

4.2 Lead Connections

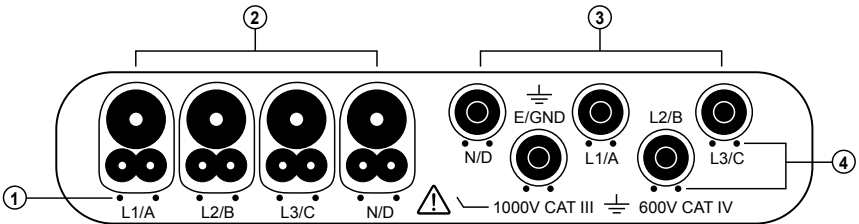


Figure 4-1

Item	Function
1	Location to plug in the current input color-coded ID markers
2	Four current input connectors for current probes <ul style="list-style-type: none"> - Current Measurement: 4-point connector. Do not forget to define the transformation ratio on the 5A Adapter Box and MN193 on the 5A range. (See § 4.3.2)
3	Five voltage input connectors <ul style="list-style-type: none"> - Voltage Measurement: L1/A, L2/B, L3/C and N/D terminals
4	Location to plug in the voltage input color-coded ID markers


Attach the color-coded input ID markers, that were shipped with the instrument, to items #1 and #4 above, to define the corresponding probe inputs and probe leads.

4.3 Instrument Configuration (Set-up mode)

NOTE: All configurations are also available through DataView® software.



The instrument must be configured the first time it is used and then whenever necessary. The configuration is saved in memory when the instrument is turned OFF.

Press the  button to configure the unit. The following sub-menus appear:

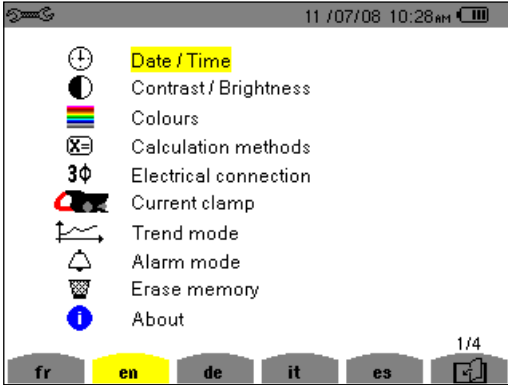





Figure 4-2

- Set the display language by pressing the yellow button corresponding to the screen language icons.
- The parameter that is ready to be configured will be highlighted in yellow. To move to a different parameter, use the ▲ and ▼ buttons.
- Press the Enter  button to select a parameter.
- Use the ◀ and ▶ buttons to change a value or setting.
- When finished, return to the Configuration menu by pressing the  button.

PARAMETER	FUNCTION
Date / Time	Sets the date and time format
Contrast / Brightness	Adjusts the contrast and brightness of the display
Colors	Defines the color of the voltage and current curves
Calculation Methods	Determines if harmonics are used or not used in calculations of reactive quantities (power and energy) <ul style="list-style-type: none"> - With harmonics: harmonics are taken into account when calculating reactive parameters. - Without harmonics: only the fundamental part is used for the calculation of reactive parameters

Electrical Connection	Determines the type of connection to the network (see § 4.3.1) <ul style="list-style-type: none"> • Single-Phase • Split-Phase • 3-Phase 4-Wire • 3-Phase 5-Wire
Current Probe	Defines the type of current probe to connect (see § 4.3.2) <ul style="list-style-type: none"> • MN93: 200A • MN193: 100A or 5A (with variable ratio) • SR193: 1000A • AmpFlex® Sensors: 3000A (measures up to 6500Arms) • MiniFlex™ Sensors: 1000A • MR193: 1000AAC/1400Adc • 5A three-phase adapter (3-channel only)
Trend (Recording) Mode	Selects the parameters to record (see § 4.3.3)
Alarm Mode	Defines the parameters of an alarm (see § 4.3.4)
Erase Memory	Deletes configurations, alarm settings, snapshots and recordings (see § 4.3.5)
About	Displays the serial number, software and hardware version

4.3.1 Electrical Hookup (electrical network)

- Highlight **Electrical Hook-up** using the ▲ and ▼ buttons, then press the  button.

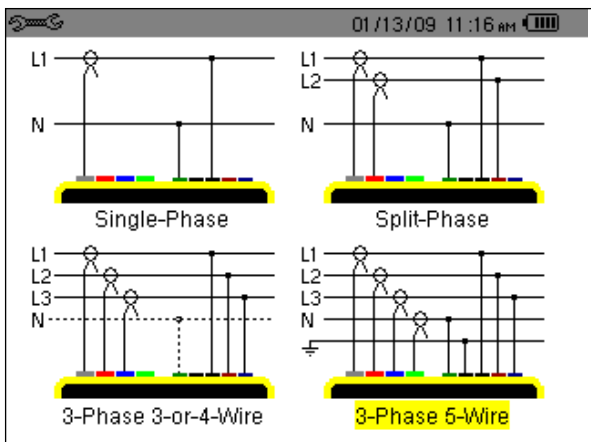



Figure 4-3

- Choose the hookup type using the arrow buttons.
- Press the  button to apply the new hookup selection.

Hookup Types:

Single or Split-phase: The neutral current is not measured or calculated.

3-Phase 3-or-4-Wire connection:

On DELTA network: **Only power totals are measured.**

Powers per phase are displayed, but not valid.

On WYE network: The neutral current is not calculated. It is necessary to connect neutral (V) to obtain the power per phase.

3-Phase 5-Wire connection: The neutral current is available and its value and waveform are displayed.

On WYE network: Powers per phase are available.

NOTE: Neutral current is calculated, not measured, in the 4 wire hookup.



V1 must be connected in all hookups, since the display is synchronized from V1 and the network frequency measured by V1.

Neutral current is calculated by adding, for each datapoint, each of the 3 measured phases of current. This assumes that all current flows through neutral. This results in a 256 datapoint waveform. If the 3 phases of current were balanced, the calculated neutral current would be 0 for every datapoint.

4.3.2 Setting the Parameters for Current Probes

- Connect the current probes to the PowerPad® before setting up the probe ratio. Use the same type of probe for each phase.
- Highlight **Current Probe** with the ▲ and ▼ buttons, then press the ↵ button.

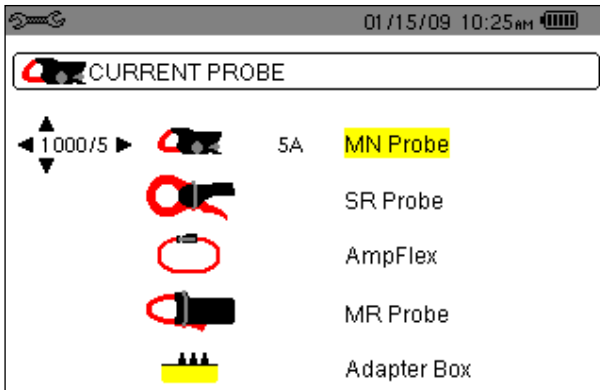


Figure 4-4

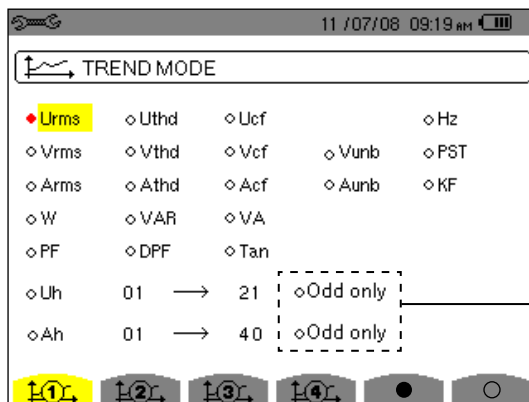
- Choose the sensor type with the ▲ and ▼ buttons.
 - The MN193 current probe (5A range only) also requires a range selection to match your probe.
 - To select the proper range, first ensure that the MN probe choice is highlighted using the ▲ and ▼ buttons.
 - Next press the ◀ button to highlight the range, then press either of the ▲ and ▼ buttons to select the desired measurement range of 200, 100 or 5 Amps. If the 5A range is selected, a choice for programming the ratio is offered.
 - To change the ratio, press the ◀ button to highlight the secondary value. Press either the ▲ and ▼ buttons to toggle this value to 1 or 5.
 - After making this selection, press the ◀ button to adjust the primary value. Each press of the ◀ and ▶ buttons will move the highlight one digit to the left or right, accordingly. Use the ▲ and ▼ buttons to change each digit position as desired. The primary range can be set between 1 and 2999.
- Press the ◀ button to apply the current sensor selection.



In addition to the four probe choices, there is an adapter selection. This selection allows the operator to use current probes that have a current output with the PowerPad®. The ratio for these probes can be programmed with this selection. The primary current can be programmed from 5 to 2999A. The secondary current can be set to 1 or 5A. Adjustment for the ratio is performed in the same way as described for the MN193 probe.

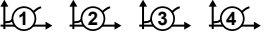



4.3.3 Setting the Parameters for a Recording (Trend Mode)

- Highlight **Trend Mode** with the ▲ and ▼ buttons, then press the ◀ button. The following screen will appear:



If these options are not selected, all the harmonics (odd and even) will be recorded.

Figure 4-5



- Four recording configurations are available.
- Choose the configuration by pressing the yellow button corresponding to the icons .
- Next, move through the choices with the ◀ and ▶ buttons and select the desired parameters with the ▲ and ▼ buttons. As you move through the parameters, each choice, in turn, will be highlighted.
- To activate the selected parameter to record, use the  button.
- The selected parameters will have a filled in  and those not selected will have an unfilled .

The recordable values are:

Value	Description
Urms	Phase-to-phase voltage (2 ϕ , 3 ϕ)
Vrms	Phase-to-neutral voltage
Arms	Phase A, B, C, N
W	Active power
PF	Power factor
Uthd	Harmonic distortion of line voltage (2 ϕ , 3 ϕ)
Vthd	Full harmonic distortion of phase-to-neutral voltage
Athd	Full harmonic distortion of current
VAR	Reactive power
DPF	Displacement factor
Ucf	Crest factor of phase voltage (2 ϕ , 3 ϕ)
Vcf	Crest factor of phase-to-neutral voltage
Acf	Crest factor of current
VA	Apparent power
Tan	Tangent
Vunb	Line voltage unbalance (2 ϕ , 3 ϕ)
Aunb	Current unbalance (2 ϕ , 3 ϕ)
Hz	Network frequency
PST	Short-term flicker
KF	K factor
?	See comment below

There are two user-defined parameters at the bottom of the window. At first, they will be listed as a question mark “?”. These parameters allow you to monitor a range of harmonics for voltage, current or power.

To activate these parameters:

- Select the ? line you want to modify using the ▲ and ▼ buttons, then press the  button to confirm.
- Next use the ▲ and ▼ buttons to scroll through the available choices (Uh, Vh, Ah, and VAh), then press .

- Use the ► button to move to the first modifiable field for this parameter. A value from 00 to 50 may be selected using the ▲ and ▼ buttons. Press the ◀ button to select the value.
- Press the ► button to move to the upper value. Use the same process to select the upper limit.
- Press the ► button again to move to the right to modify the last value needed to complete the definition. Here you will choose whether to include all harmonics or only the odd harmonics.
- Use the ▲ and ▼ buttons to make this selection. The diamond preceding the **Odd Only** choice will appear filled in \blacklozenge for selected and unfilled \blacklozenge for not selected.

Example of a user defined choice: Vh 02 → 15 \blacklozenge Odd Only.


In this user defined condition, all odd voltage harmonics between the 2nd and the 15th will be recorded.

- Press the ◀ button when you have finished selecting all the parameters to be recorded to apply the new setup.



The battery may fully discharge when recording for long periods of time while not connected to a power supply. The PowerPad® will continue to record for some time, even if below the minimum battery charge value. However, the display may not come back on, and will eventually stop saving data when the battery is too low. All data recorded will be saved. If in the Record Mode, and the display does not come ON, do not turn the instrument OFF. Supply power to the PowerPad® with the power cord and the display will come back ON when any button (other than ON/OFF) is pressed.

4.3.4 Setting the Parameters for Alarms

- Highlight **Alarm Mode** with the ▲ and ▼ buttons, then press the  button.

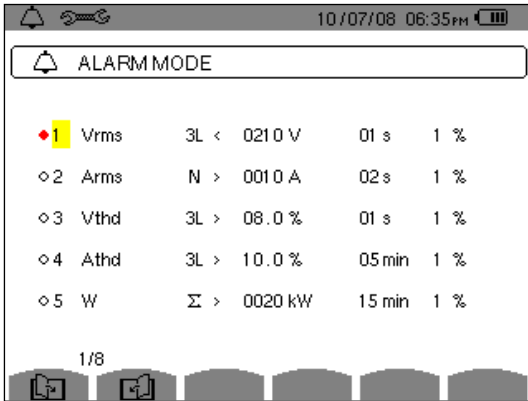






Figure 4-6

- There are five user-defined parameters. At first, they will be listed as a question mark “?” Select the line you want to modify using the ▲ and ▼ buttons, then press the  button to confirm.
- Use the ▲ and ▼ buttons to browse and select the value, then press the  button to confirm the choice.
- To navigate horizontally, use the ◀ and ▶ buttons, then confirm with . Select the values with the ▲ and ▼ buttons, then confirm with .

For each alarm to define, select:

- The type of alarm (Vah, Ah, Uh, Vh, Tan, PF, DPF, VA, VAR, W, Athd, Uthd, Vthd, KF, Hz, Aunb, Vunb, Vrms, Acf, Ucf, Vcf, PST, Arms, Urms and Vrms).
- The harmonics range (between 0 and 50 for Vah, Ah, Uh and Vh).
- The alarm filter (3L: 3 individually monitored phases or N: monitoring neutral or Sigma/2 or Sigma/3 or Sigma).
- The meaning of the alarm (> or < for Arms, Urms, Vrms, Hz only, otherwise the direction is unique).
- The threshold for triggering the alarm (10 possible settings of the alarm in the following cases: W, VAR and VA).
- The minimum duration for exceeding alarm validation threshold (in minutes, seconds, or for Vrms, Urms and Arms, in hundredths of seconds).
- The hysteresis value (corresponds to the percentage added or taken away from the alarm threshold chosen that will stop the alarm in the event of overrun - Value 1, 2, 5 or 10%).
- Activating the alarm (read item) or deactivating it (see next page).

- After the configuration has been completed, activate the alarm by positioning the yellow cursor in the first column on the left using the ◀ button, press ↵. Activation is confirmed if there is a filled in ♦ to the left of the alarm.
- To display the alarm screen pages, press the yellow buttons corresponding to the ↶ and ↷ icons.

4.3.5 Erasing Memory

When **Erase Memory** is selected, the following screen will appear:



Figure 4-7

To erase partially:

- Select the recording from the Trend, Transient or Alarm file that you want to delete using the ▲ and ▼ buttons, then press ↵. Validation is confirmed by the ♦ to the left of the selected parameter.
- To complete the deletion, press the yellow button corresponding to the 🗑 icon, then press the ↵ button to confirm.

To erase all:


- Press the yellow button corresponding to the ● icon, then press ↵. Validation is confirmed by the ♦ to the left of all parameters.
- To deselect a parameter, press the yellow button corresponding to the ○ icon.
- To complete the deletion, press the yellow button corresponding to the 🗑 icon, then press the ↵ button to confirm.



WARNING: By choosing to delete all data, **all** detected alarms, screen snapshots, captured transient states and all recordings are deleted.




To leave this screen without deleting anything, press the ↶ button.

DISPLAY MODES

To select parameters in all modes, use the ◀▶▲▼ buttons to move to the desired parameter and use the  button to confirm selections.

5.1 Waveform Mode

This mode enables the current and voltage graphs to be displayed, together with the values measured and calculated from the voltages and currents (except for power, energy and harmonics).




Item	Measurement Type
RMS	Measurement of the true effective value
THD	Measurement of total harmonic distortion
CF	Measurement of the peak factor
	Display of min, max and average values
	Simultaneous display of all voltage and current measurements
	Display of Fresnel diagram of signals

5.1.1 RMS Measurement

This sub-menu displays the waveforms over a period of the measured signals and the true effective values of the voltage and the current.



The choice of graphs to be displayed depends on the type of electrical connection that was set up during the configuration (see § 4.3).

- Single-phase: no choice (L1)
- Two-phase: 2V, 2A, L1, L2
- Tri-phase 3 or 4 wires: 3U, 3V, 3A, L1, L2, L3
- Tri-phase 5 wires:
 - For **THD**, **CF** and  : 3U, 3V, 3A, L1, L2 and L3
 - For **RMS**,  and  : 3U, 4V, 4A, L1, L2, L3 and N

The screen captures shown in this section are examples of those obtained with a 3-Phase 5-Wire connection.

5.1.1.1 RMS Display Screen in 3U

This screen displays the three line voltages of a 3-Phase system.

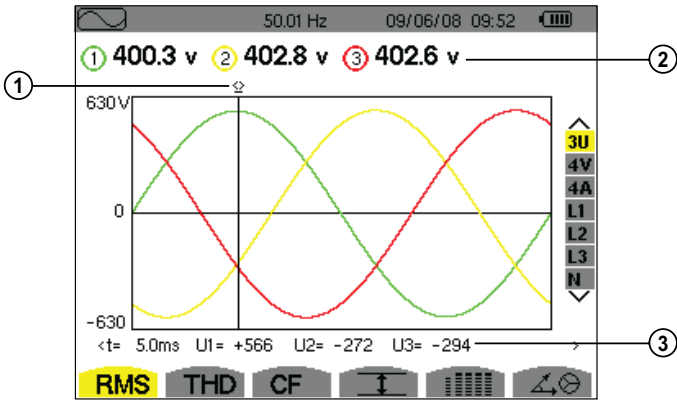


Figure 5-1

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Effective values of line voltages
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) U1 : instantaneous value of the line voltage between phases 1 and 2 (U12) U2 : instantaneous value of the line voltage between phases 2 and 3 (U23) U3 : instantaneous value of the line voltage between phases 3 and 1 (U31)

5.1.1.2 RMS Display Screen in 4V

This screen displays the three phase voltages and the neutral relative to the earth of a 3-Phase system.

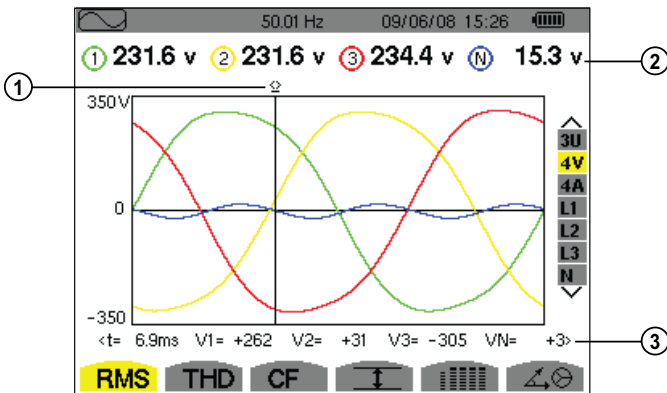


Figure 5-2

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Effective values of phase voltages
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) V1 : instantaneous value of the phase voltage of graph 1 V2 : instantaneous value of the phase voltage of graph 2 V3 : instantaneous value of phase voltage of graph 3 VN : instantaneous value of neutral

5.1.1.3 The RMS Display Screen in 4A

This screen displays the three phase currents and the neutral relative to the earth of a 3-Phase system.

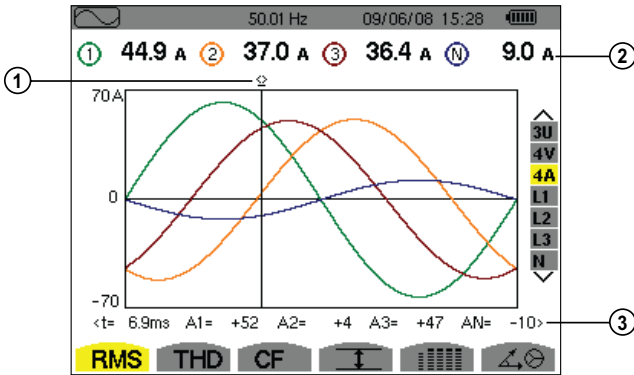


Figure 5-3

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Effective values of currents
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) A1 : instantaneous value of the phase current of graph 1 A2 : instantaneous value of the phase current of graph 2 A3 : instantaneous value of phase current of graph 3 AN : instantaneous value of neutral

5.1.1.4 RMS Display Screen in Neutral

This screen displays the neutral voltage relative to earth and the current of the neutral.

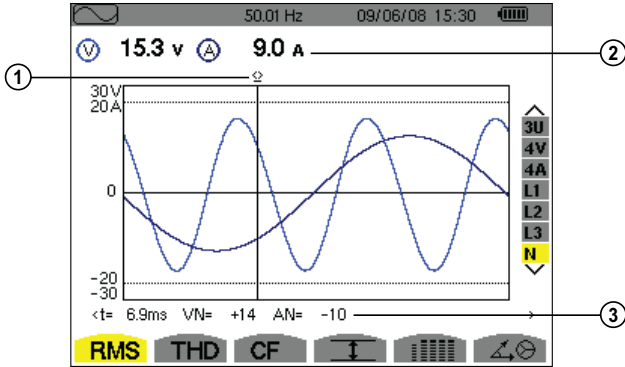


Figure 5-4

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Effective values of currents
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) VN : instantaneous value of the neutral AN : instantaneous value of the neutral

5.1.2 THD Measurement of Total Harmonic Distortion

This sub-menu displays the waveforms over a period of the measured signals and the total harmonic distortion rates for voltage and current.

5.1.2.1 THD Display Screen in 3U

This screen displays the waveforms of a period of the line voltages and the total harmonic distortion rates.

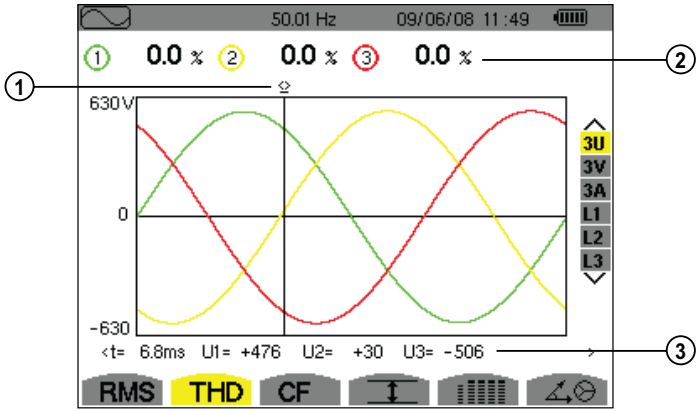


Figure 5-5

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Harmonic distortion rate for each graph
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) U1 : instantaneous value of the line voltage between phases 1 and 2 (U12) U2 : instantaneous value of the line voltage between phases 2 and 3 (U23) U3 : instantaneous value of the line voltage between phases 3 and 1 (U31)

5.1.2.2 THD Display Screen in 3V

This screen displays the waveforms of a period of the phase voltages and the total harmonic distortion rates.

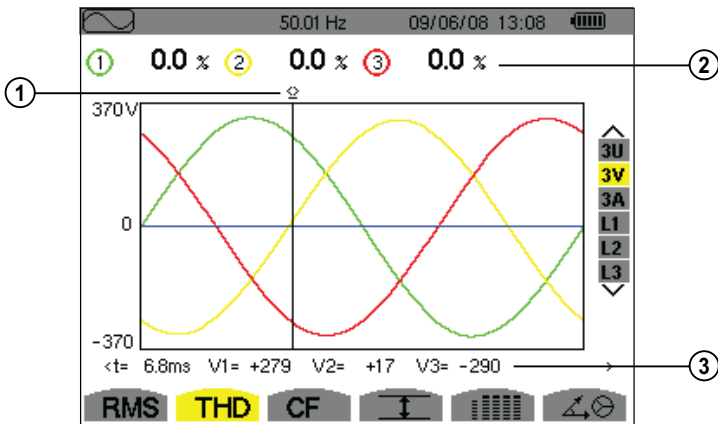


Figure 5-6

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Harmonic distortion rate for each graph
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) V1 : instantaneous value of the phase voltage of graph 1 V2 : instantaneous value of the phase voltage of graph 2 V3 : instantaneous value of phase voltage of graph 3

5.1.2.3 THD Display Screen in 3A

This screen displays the three phase currents and the neutral relative to the earth of a 3-Phase system.

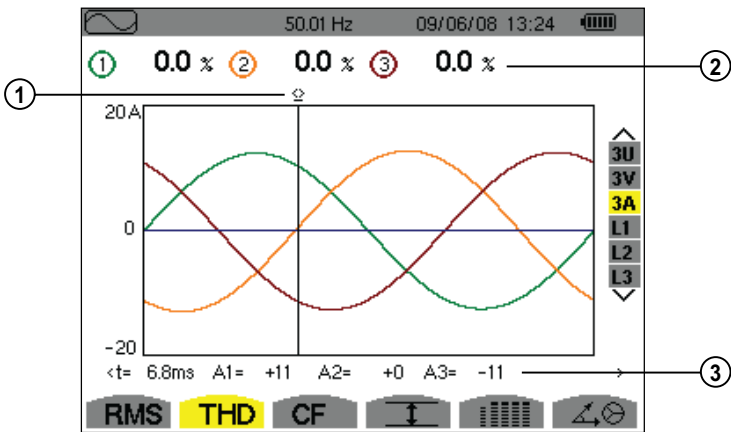


Figure 5-7

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Harmonic distortion rate for each graph
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) A1 : instantaneous value of the phase current of graph 1 A2 : instantaneous value of the phase current of graph 2 A3 : instantaneous value of phase current of graph 3

5.1.3 Measurement of the Peak Factor (CF)

This sub-menu displays the waveforms over a period of the measured signals and the voltage and current peak factor.

5.1.3.1 CF Display Screen in 3U

This screen displays the waveforms of a period of the line voltages and the peak factors.

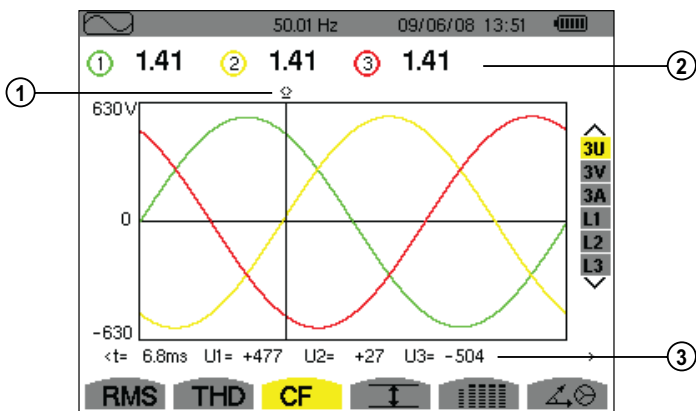


Figure 5-8

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Peak factor for each graph
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) U1 : instantaneous value of the line voltage between phases 1 and 2 (U12) U2 : instantaneous value of the line voltage between phases 2 and 3 (U23) U3 : instantaneous value of the line voltage between phases 3 and 1 (U31)

5.1.3.2 CF Display Screen in 3V

This screen displays the waveforms of a period of the phase voltages and the peak factors.

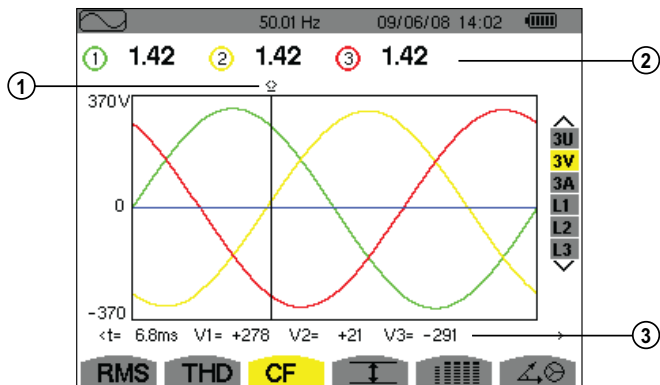


Figure 5-9

Item	Function
1	Instantaneous value cursor; change values with the ◀ and ▶ buttons
2	Peak factor for each graph
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) V1 : instantaneous value of the phase voltage of graph 1 V2 : instantaneous value of the phase voltage of graph 2 V3 : instantaneous value of phase voltage of graph 3

5.1.3.3 CF Display Screen in 3A

This screen displays the waveforms of a period of the currents and the peak factors.

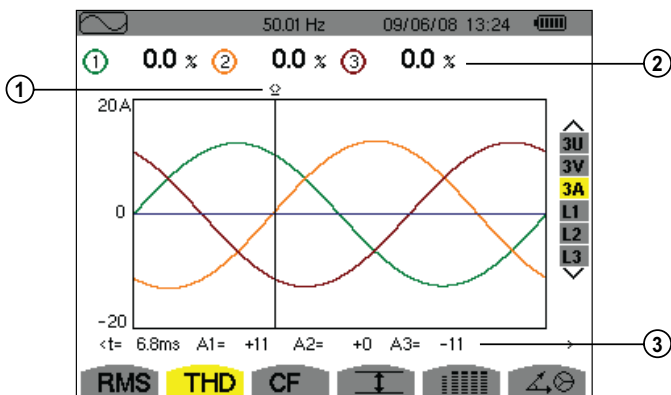


Figure 5-10

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Peak factor for each graph
3	Instantaneous value of the signals at the intersection of the cursor and the graphs t : time relative to the start of the period (expressed in milliseconds) A1 : instantaneous value of the phase current of graph 1 A2 : instantaneous value of the phase current of graph 2 A3 : instantaneous value of phase current of graph 3

Note: L1, L2 and L3 display the peak factors of the current and of the voltage respectively for phases 1, 2 and 3.

5.1.4 Measurement of Min, Max, Average, Voltage and Current Values

This sub-menu displays the RMS, maximum, minimum and average values for voltage and current, together with those for the instantaneous positive and negative voltage and current peaks.

NOTE: The display screen varies depending on which value is selected.

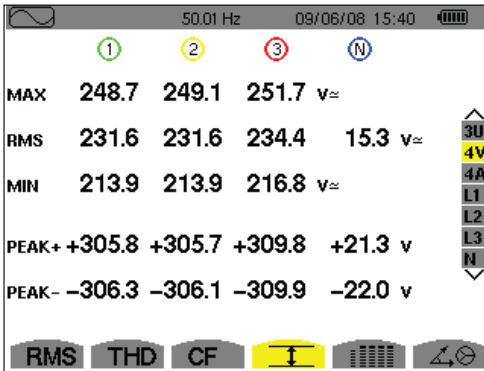




Figure 5-11

The columns display the values relative to each voltage, current or neutral graph.

Item	Function
MAX	Maximum RMS value of the voltage or current from powering of the PowerPad® or from the last time the  button is pressed.
RMS	True effective value of voltage or current
MIN	Minimum RMS value of the voltage or current from powering of the PowerPad® or from the last time the  button is pressed.
PEAK+	Maximum peak value of the voltage or current
PEAK-	Minimum peak value of the voltage or current

Note: The Max and Min RMS measurements are calculated every half-period (e.g. every 10ms for a signal at 50Hz). The measurements are refreshed every 250ms.

5.1.5 Simultaneous Display

This sub-menu displays all the voltage and current measurements (RMS, DC, THD, DF, CF, PST, KF).

NOTE: The display screen varies depending on which value is selected.

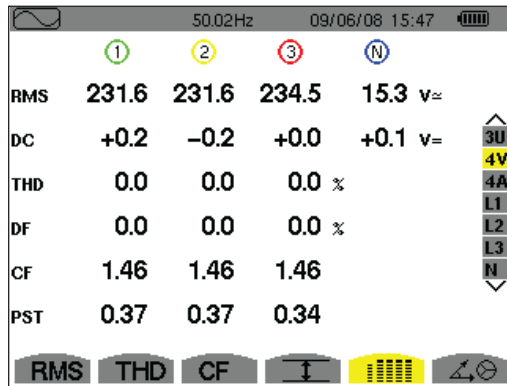


Figure 5-12

Item	Function
RMS	True effective value of voltage or current
DC	Direct component
THD	Total harmonic distortion rate
DF	Distortion factor
CF	Peak factor calculated in relation to the displayed waveform
PST	Short-term flicker (over 10 minutes)
KF	K factor - Oversizing of transformer relative to harmonics

Note: L2 and L3 give information concerning simultaneous display of the current and of the voltage respectively for phases 2 and 3.

5.1.6 Display of Fresnel Diagram

This sub-menu displays the absolute values of the voltages and currents at the fundamental frequency, the phase displacement of the voltages relative to the currents and the unbalances of the voltages and currents.

NOTE: The display screen varies depending on which value is selected.

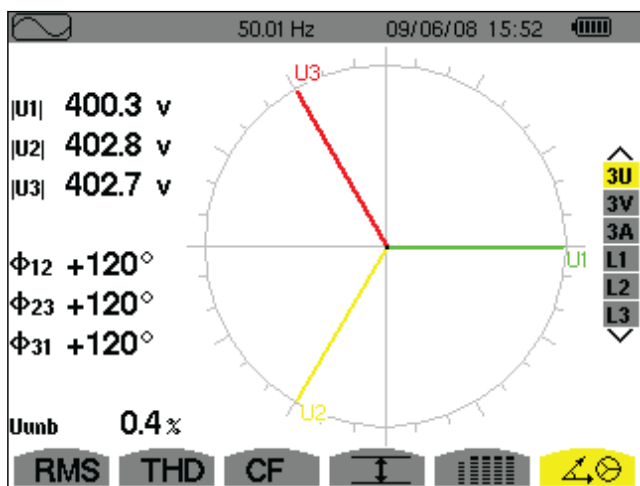


Figure 5-13

Item	Function
U1, U2, U3	Absolute values of the voltages at fundamental frequency
V1, V2, V3	Absolute values of the voltages at fundamental frequency
A1, A2, A3	Absolute values of the current at fundamental frequency
ϕ_{12}	Phase displacement of phase 1 relative to phase 2
ϕ_{23}	Phase displacement of phase 2 relative to phase 3
ϕ_{31}	Phase displacement of phase 3 relative to phase 1
ϕ_{VA}	Phase displacement of voltage (V) relative to current (A)
Unb	Unbalance of line voltages

Note: L2 and L3 display the absolute value of the current and of the voltage at the fundamental frequency and the phase displacement of the voltage relative respectively to phases 2 and 3.

5.2 Power and Energy Mode **W**

This sub-menu displays the measurements for power and energy.

NOTE: The display screen varies depending on which value is selected.

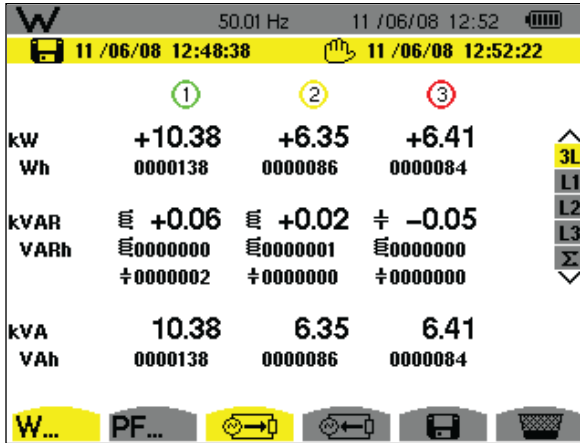




Figure 5-14

Item	Function
W	Display of power
PF	Display of power factor (Note: the display screen for the PF... button is only available for the 3L filter)
	Display of energy consumed (active, reactive and apparent power)
	Display of energy generated (active, reactive and apparent power)
	Starts the measurement
	Resets the energy value to zero
	Stops the measurement
DPF	Displacement factor
Tan	Tangent
Wh	Active energy generated
VAR	Inductive reactive power
WARh	Reactive energy consumed
	- Inductive - Capacitive
VA	Apparent power (total if 3 ϕ)
VAh	Apparent energy consumed
VARh	Reactive energy


5.2.1 Starting and Stopping Energy Measurements

- To start a measurement, press the  icon's yellow button. The date and time at which the measuring starts will appear in the upper left hand corner of the screen.
- To stop the measurement, press the  icon's yellow button. The date and time at which the measuring stops will appear in the upper right hand corner of the screen.



If the measurement is stopped, this interruption is final. No continued measuring will be possible. All energy meters will be stopped.

5.2.2 Resetting the Measurement to Zero

To reset the measurement, press the  icon's yellow button to confirm.

All energy values (consumed and generated) are reset.

RECORDING MODES

To select parameters in all modes, use the ◀▶▲▼ buttons to move to the desired parameter and use the ↵ button to confirm selections.

6.1 Waveform Capture Mode

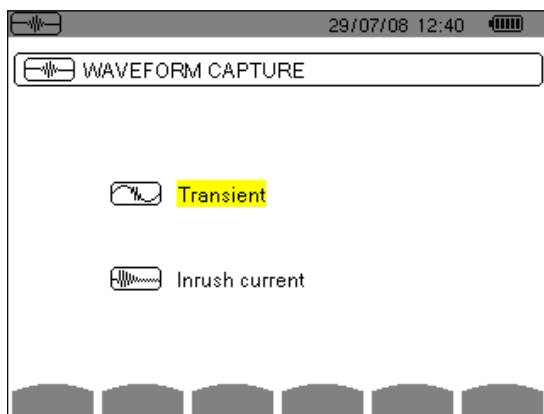


Figure 6-1

Press the waveform display mode button. The *Waveform Capture* screen appears with two submenus. Select either the **Transient mode** (§ 6.1.1) or the **Inrush Current mode** (§ 6.1.2) using the ▲ and ▼ buttons, then confirm with ↵.

To return to the *Waveform Capture* screen, press ↶.

6.1.1 Transient Mode

This mode enables transients to be recorded, the list of recorded transients to be viewed, and if necessary, deleted. All tracks are stored in memory for each transient (regardless of the connection configuration). You can record up to 210 transients.

NOTE: When the Transient mode is selected, the display screen will depend on the following conditions:

if ...	then ...
no record has been made	the <i>Detection Schedule</i> screen is displayed
transients have been recorded	the <i>Recording List</i> screen is displayed

6.1.1.1 Programming and Starting a Search

To program the search for a transient, proceed as follows:

Select the submenu by pressing the  icon's yellow button. The *Detection Schedule* screen is displayed.

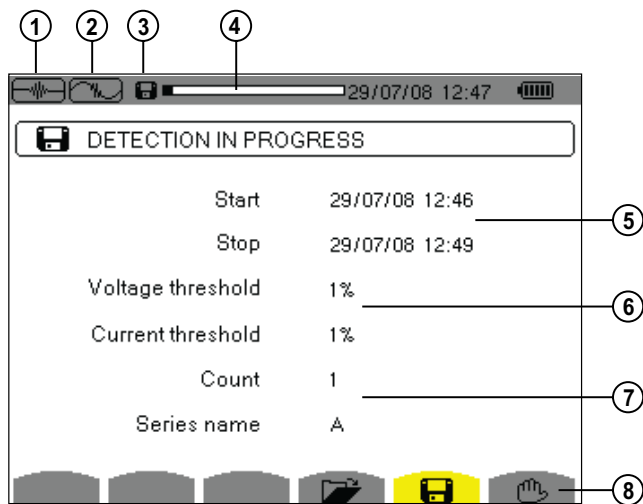





Figure 6-2

Item	Function
1	Reminder of the mode used
2	Display of sub-mode used
3	Flashing  icon: indicates that the search has been started
4	Memory indicator. Black area = used memory; White area = available memory
5	Transients search start and end times
6	Adjustment of Voltage & Current activation thresholds (1%, 2%, 5%, 10%, 20%, 50%, 100%) Voltage %: Based on 480V Current %: Based on max. current of the probe
7	Choice of number and name of transients (210 max)
8	The  icon is displayed when programming starts.

To configure and start the programming of a search:

1. Select and set the desired configurations for the Start/Stop date and time, the Voltage and Current threshold, Count and Series name.
2. To start programming a search between the start and end times which you have defined press the yellow button for the **OK** icon.
 - The **OK** icon disappears and the  icon appears instead.
 - When the start time is reached the message *Search pending* is displayed.

- When the end time is reached, the **OK** icon (bottom right of screen) is displayed again. It is then possible to program a new search.



Transients are recorded in relation to the voltage and/or the current in accordance with the configured activation thresholds. If an activation occurs in relation to the current, a record of the current waveform and voltage is made.

6.1.1.2 Stopping a Search

The search can be manually stopped before the end time and date by pressing the icon's yellow button. The **OK** icon will reappear in the same location.

6.1.1.3 Displaying a Transient

To display the recorded transient, proceed as follows:

1. Select the submenu by pressing the icon's yellow button. The *Recording List* screen is displayed.

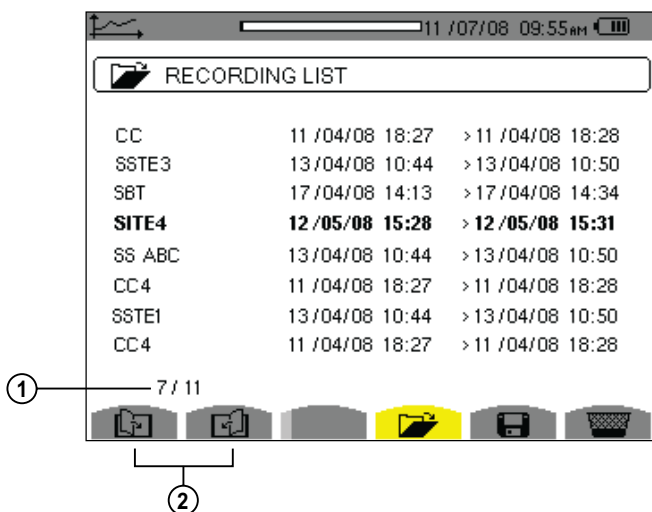


Figure 6-3

Item	Function
1	The displayed value indicates the page number and the number of pages.
2	These icons let you browse through the previous and next screens. Press the yellow buttons corresponding to these icons to display the pages.

2. Select the line of the transient to be displayed. The selected field appears in bold text. The screen displays the transients in the form of graphs.

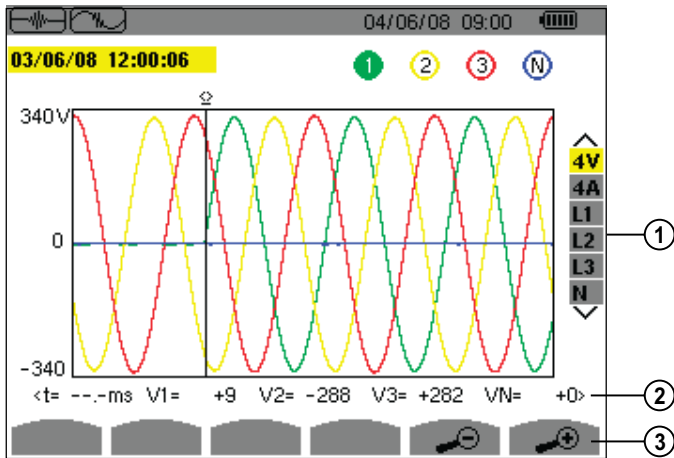





Figure 6-4

Item	Function
1	Selection of graphs to be displayed - 4V : displays the 4 single voltages during the transient (here in a 5-wire tri-phase connection) - 4A : displays the 3 currents and the neutral current during the transient - L1, L2 or L3 : displays the current and the single voltage successively in relation to phases 1, 2 and 3 - N : displays neutral
2	Instantaneous value of the signals according to the position of the cursor on the scale. To move the cursor use the ▲ and ▼ buttons.
3	🔍⊖ : Zoom Out - To zoom out press the yellow button for this icon. 🔍⊕ : Zoom In - To zoom in press the yellow keypad key for the icon.

3. To return to the *Recording List* screen, press .

6.1.1.4 Deleting a Transient

From the *Recording List* screen (see § 6.1.1.3), press the  icon's yellow button. Select the transient to be deleted using the ▲ and ▼ buttons, then press the  symbol.

To leave this screen without deleting, press any of the Mode buttons on the PowerPad®.

To return to the *Waveform Capture* screen, press .

6.1.2 Inrush Current Mode


This mode enables the waveform of the current to be recorded, captured, and deleted. The PowerPad® keeps only a single current waveform capture in memory.

NOTE: When Inrush Current mode is selected the display screen will depend on the following conditions:

if ...	then ...
no capture has been made	the <i>Capture Schedule</i> screen is displayed
captures have been made	the <i>Capture Parameters</i> screen is displayed

6.1.2.1 Programming the Capture of a Waveform

To program the capture of the current's waveform, proceed as follows:

1. Select the sub-menu by pressing the  icon's yellow button. The *Capture Schedule* screen is displayed.

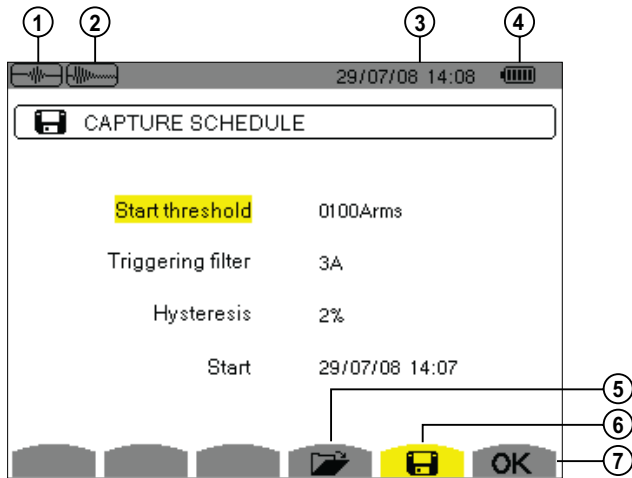




Figure 6-5

Item	Function
1	Reminder of the mode used
2	Display of sub-mode used
3	Current date and time
4	Battery charge level
5	Displays the parameters of the capture
6	Programs the capture
7	OK: confirms programming of a capture  : deletes a capture (this icon is displayed if a capture has been made)

2. Select the **Start threshold** field using the ▲ and ▼ buttons. The selected field is highlighted in yellow. Press  to enter the type of values.

Use the ▲ and ▼ buttons to increase or decrease a value and press ◀ and ▶ buttons to switch to the next value field.


3. Press  to confirm programming of the activation threshold.

Proceed in the same manner for the **Triggering filter**, **Hysteresis** and **Start** fields.

Note: For more information on the hysteresis, refer to Appendix A: Mathematical Formulas.

6.1.2.2 Starting a Capture

To start programming the capture at the defined start date and time, press the yellow button corresponding to the **OK** icon.


- The **OK** icon disappears and the  icon appears instead.
- When the activation conditions are met and the start time is reached, the message *Capture pending* is displayed and the memory indicator appears at the top of the screen. The indicator is displayed **only** during the capture and disappears when the capture is completed.
- If the capture is completed with a stop event or if the memory is full, the capture stops automatically. The *Capture Schedule* screen with the **OK** icon (bottom right of screen) is displayed again.



The PowerPad® can keep only a single current waveform capture in memory. If you wish to make another capture, delete the previous one first.

To return to the *Waveform Capture* screen, press .

6.1.2.3 Manually Stopping a Capture

The capture can be manually stopped by pressing the  icon's yellow button. The **OK** icon will reappear in the same location.

6.1.2.4 Displaying the Parameters of a Capture

To display the parameters of a capture, proceed as follows:


1. Select the sub-menu by pressing the  icon's yellow button. The *Capture Parameters* screen is displayed.



Figure 6-6

Choose the type of display, RMS or PEAK, by pressing the corresponding yellow button for the icons. The PowerPad® displays the waveform of the current. You can then move the cursor along the graph and zoom in and out.

Available information is:

- Instantaneous value of the current at the instant pointed to by the cursor.
- Maximum instantaneous value of the current (over the entire start-up period).
- RMS value of the half-period (or lobe) of the current on which the cursor is positioned.
- Maximum half-period RMS value of the current (over the entire start-up period).
- Maximum instantaneous value of the start-up period (PEAK).
- Start time and duration of engine start-up.



A voltage must be present on the phase before the motor start-up for a stable and correct frequency control.

Example of RMS Display in 3A (3 current measurement)

This mode enables the record of the trend of the half-period true effective value of the current to be displayed.

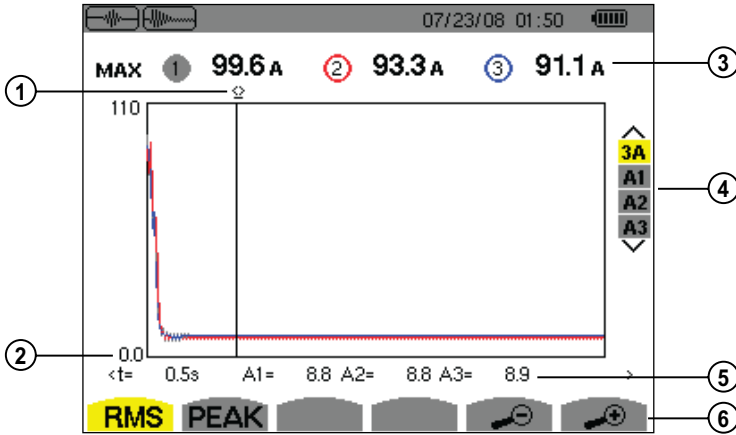


Figure 6-7

Item	Function
1	Instantaneous value cursor; change values with the cursor using the ◀ and ▶ buttons
2	Scale of values in amperes
3	<ul style="list-style-type: none"> - Maximum half-period RMS value of the start-up - Indicator of number attributed to the displayed graph - Value of the measured current
4	Selection of graphs to be displayed: <ul style="list-style-type: none"> - 3A: displays the 3 currents and the neutral current during the transient. - A1, A2, A3: displays the current successively in phases 1, 2 and 3.
5	<ul style="list-style-type: none"> - t: temporal position relative to the cursor ($t = 0$ corresponds to the start of the start-up) - A1, A2, A3: instantaneous values of currents 1, 2 and 3 at the position of the cursor
6	<ul style="list-style-type: none"> ◯ : Zoom Out - To zoom out press the yellow button for this icon ⊕ : Zoom In - To zoom in press the yellow keypad key for the icon



Note: Filters A1 and A3 display the record of the trend of the half-period true effective value of the current over phases 1 and 3. The screen is identical to the one displayed for filter A2.

6.2 Harmonics Mode

Press the harmonic display mode button - 

Use the function buttons to select the type of harmonic analysis. Example screens and descriptions are shown in the following sections.

V - Single phase voltage analysis
A - Current analysis
VA - Power and direction flow analysis
U - Phase-to-phase voltage analysis

The  and  buttons allow the user to zoom in or out, in increments of 2%, 5%, 10%, 20%, 50% and 100%.

6.2.1 Single Phase Voltage Analysis

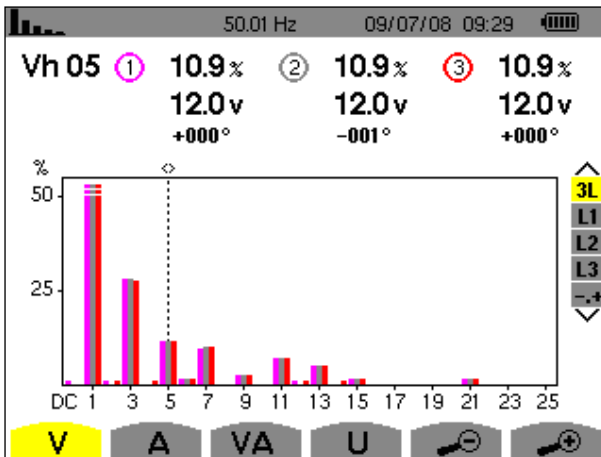


Figure 6-8

Values measured for each phase, at cursor position (in the example shown above, the 5th harmonic is selected and displayed).

The information displayed is:

- Harmonic order
- Percentage relative to the fundamental
- RMS value
- Phase angle in relation to the fundamental, according to the measurement type chosen (in this example V) with the variable function buttons just below the screen.

The cursor enables selection up to 50th harmonic, with the ◀ and ▶ buttons. As soon as the 25th harmonic is reached, the 25th to 50th range appears (0 represents the DC component).

Selection of expert mode \pm is available for 3-Phase hookups by pressing the ▲ and ▼ buttons.

6.2.2 Single Phase Current Analysis

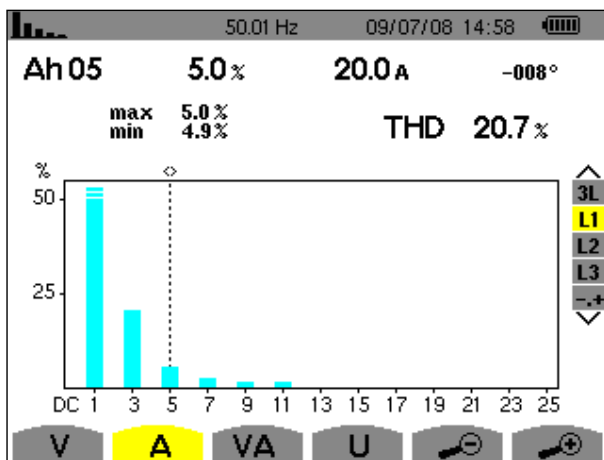


Figure 6-9

Selection of 3-Phase or individual phases L1, L2 and L3, displays:

- The total THD (total harmonic distortion)
- The parameters for the harmonic order selected by the cursor:
 - Percentage in relation to the fundamental
 - RMS value and phase angle in relation to the fundamental component
- MIN, MAX instantaneous values for the selected current harmonic



MIN, MAX values are reset each time the cursor position is changed.

6.2.3 Harmonic Analysis in Expert Mode

This mode is available with a 3-Phase connection only.

Press on the ▲ ▼ buttons to select “-,+” and then either the V or A sub-menu.

Example of a typical display:

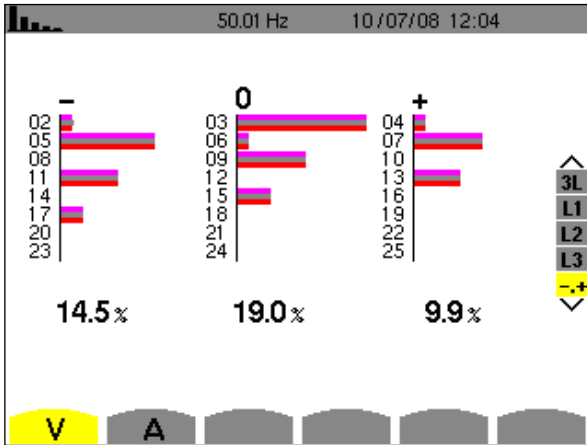


Figure 6-10

- **Column One:** The harmonics inducing a negative sequence.
- **Column Two:** Those inducing a zero sequence (triplens added into the neutral).
- **Column Three:** Those inducing a positive sequence.

Harmonic content is useful to evaluate the influence of harmonics that cause heating of the neutral or on rotating machines.


6.3 Alarm Mode

This mode detects the type of alarm that you wish to monitor (Vah, Ah, Uh, Vh, Tan, PF, DPF, VA, VAR, W, Athd, Uthd, Vthd, KF, Hz, Aunb, Vunb, Vrms, Acf, Ucf, Vcf, PST, Arms Urms and Vrms – see Appendix B: Glossary of Terms).



All alarms recorded can be downloaded to a PC with DataView® software (see § 7). Up to 10,000 alarms can be captured.

6.3.1 Programming an Alarm

1. Press the Alarm mode button . The *Detection Schedule* screen will appear.



To program/display alarms, they must first be configured (see § 4.3.4)

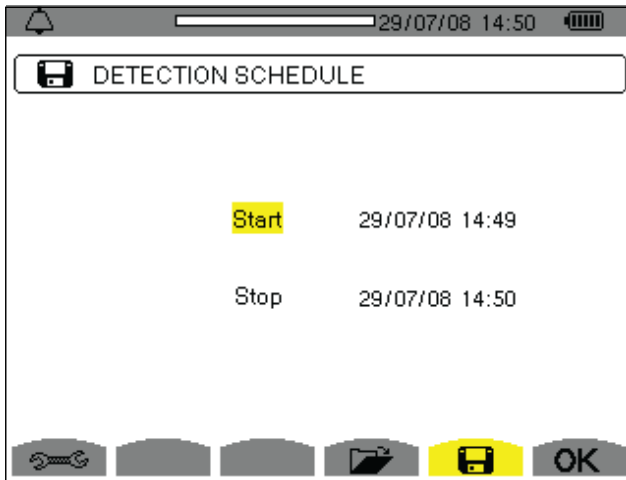











Figure 6-11


Item	Measurement Type
	Configures alarms
	Displays alarm log
	Programs an alarm
OK	Validates the programming of an alarm (after OK is selected, the  icon appears)
	Manually stops an alarm that is in progress

2. With the start field highlighted in yellow, press  to enter the date and time.
3. Use the ▲ and ▼ buttons to increase or decrease the value. Use the ◀ and ▶ buttons to move to the next parameter.
4. When completed, confirm the Start alarm schedule with .
5. Use the ▼ button to set the Stop alarm settings, then repeat the previous steps.

6.3.2 Starting an Alarm

1. Press the **OK** icon's yellow button to launch the alarm campaign between the start and end times that you specified.
2. The **OK** icon disappears and the  icon appears instead.
3. The *Campaign on standby* message is displayed while awaiting start time and the  icon blinks on the screen's top display bar.
4. The *Campaign running* message is displayed when start time begins.
5. The *Detection Schedule* screen with the **OK** icon (bottom right-hand side of the screen) are displayed when the end time is reached. You can then program a new alarm campaign.


6.3.3 Manually Stopping an Alarm

An alarm can be manually stopped by pressing the  icon's yellow button. The **OK** icon will reappear in the same location.

6.3.4 Displaying an Alarm Log

Press the  icon's yellow button to view the alarm log. The log can contain a maximum of 14,336 alarms.



The type of connection selected in the configuration mode  does not affect the possibilities of alarm filter choice and monitored parameter. Users are responsible for these choices.

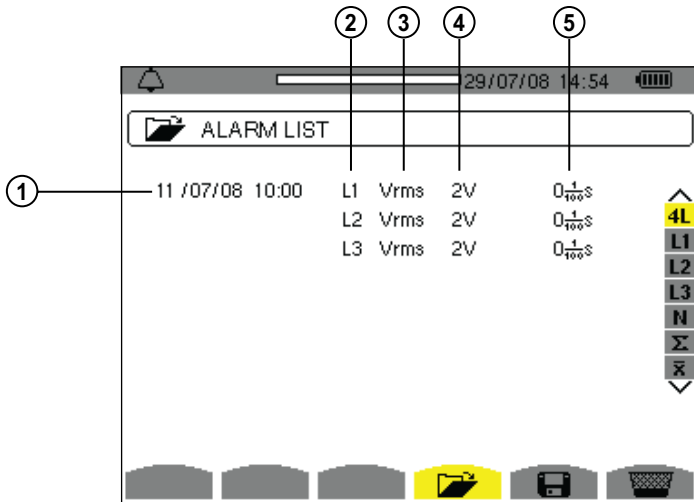





Figure 6-12

Item	Function
1	Alarm date and time
2	Alarm filter
3	Monitored parameter (Vrms, etc.)
4	Amplitude (min or max)
5	Alarm duration

6.3.5 Deleting an Alarm Log

1. Press the  icon's yellow button
2. Select the alarm to be deleted using the ▲ or ▼ button, then press the  button to confirm deletion.


To leave this screen without deleting any alarm, press the  button.

6.4 Trend Mode

6.4.1 Programming and Starting a Recording



The ON/OFF light will blink when the recording is in progress. When the recording is done, the ON/OFF light will turn off. You will need to press it again to restart the instrument.

This mode enables all the parameters previously configured in the Configuration mode  to be recorded (see § 4.3).



1. Press the Trend mode button - .




Figure 6-13

1. Select the Configuration that was previously set-up (see § 4.3) by using the ▲ or ▼ button to highlight **Set-up**, then press the ▽ button.
2. Use the ▲ or ▼ button to choose Configuration 1, 2 3 or 4, then press ▽.
3. Select the Start field using the ▼ button. Press ▽ to select the date and time field, then use the appropriate arrow buttons to change the date and time. Press ▽ when finished.
4. Using the same method as steps 1, 2 and 3, use the arrow buttons and the ▽ button to change the values for Stop, Period and Name.
5. Press the **OK** icon's yellow button to begin recording between your specified start and end times. The **OK** icon disappears and the icon  appears.

6. The *Recording on Standby* message is displayed and the icon blinks on the top display bar. Once the start time has been reached, the Recording running message is displayed.
7. When the recording is finished, the *Programming a recording* screen will appear and the **OK** icon reappears.

6.4.2 Manually Stopping a Recording

An alarm can be manually stopped by pressing the  icon's yellow button. The **OK** icon will reappear in the same location.

6.4.3 Displaying the Recording List

Press the  icon's yellow button to view the recording list.

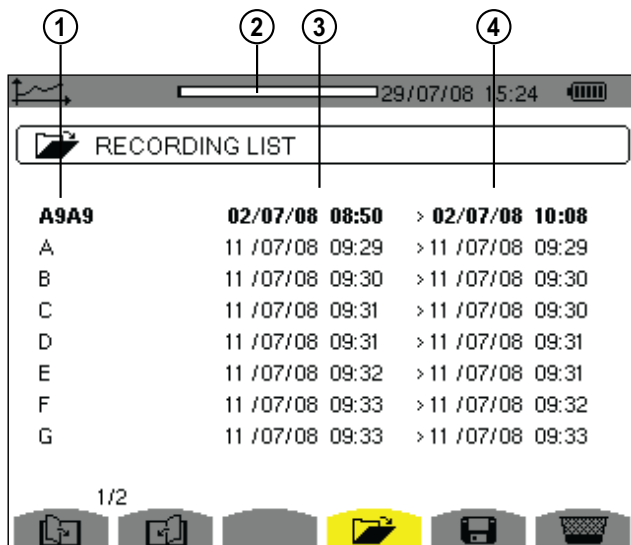





Figure 6-14

Item	Function
1	Recording name
2	Memory usage
3	Recording start time
4	Recording end time





6.4.4 Deleting a Recording

1. Press the  icon's yellow button
2. Select the recording to be deleted using the ▲ or ▼ button, then press the  button to confirm deletion.

To leave this screen without deleting any alarm, press the  button.

6.5 Snapshot Mode


This button allows 50 snapshots to be saved for future recall and evaluation.

- Press the  button (for about 3s) to capture the current display.
- The  icon is displayed in the top left corner as soon as the operation is successful.
- This icon is replaced by  if there is no space left in the memory to record the display.
- The snapshot will record all measurements present at the input of the meter when you press the  button.



These screens can be downloaded to a computer using DataView®

6.5.1 Opening a Previously Saved Snapshot

- A **short press** (about 1s) on the  button gives access to the menu of snapshots that have been saved.
- The small icon to the left of each snapshot (date and time) tells you what type of data was stored.

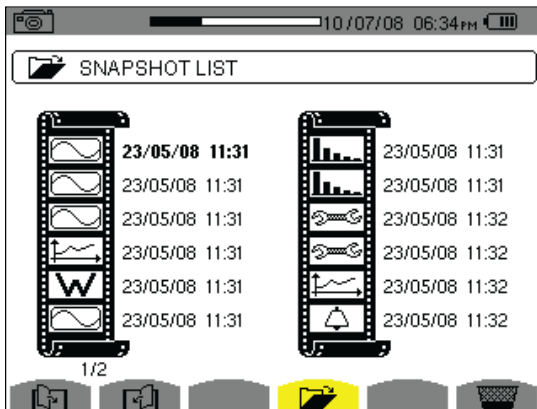







Figure 6-15


- Use the ▲ or ▼ buttons to select the snapshot.
- To display the snapshot, press the  button, then the  button.
- After reviewing the snapshot, press the  button again to return to the list of saved snapshots.



The various storage spaces of the PowerPad® are of a fixed size and are completely independent. There are four memory spaces available (alarms, snapshot, transients and recordings).


6.5.2 Deleting a Snapshot

1. Press the  icon's yellow button
2. Select the snapshot to be deleted using the ▲ or ▼ button, then press the  button to confirm deletion.

To leave this screen without deleting any alarm, press the  button.

6.5 Help

Press this button to obtain help for the current display mode.

To exit the Help mode, press the  button once again.

DATAVIEW® SOFTWARE

7.1 Features

DataView® has a simple, easy-to-use interface for configuring and running tests with the PowerPad®, as well as printing reports of the test results. There are many features that are available through this program. A few of the most popular are listed below.

- Configures and displays all functions of the PowerPad®
- Runs tests from your computer with a simple click and execute process
- Views and captures data in real time
- Retrieves data from the instrument's memory
- Plots graphs of recorded information that has been downloaded
- Presents reports, including your analysis in the comments section
- Stores a library of setups for different applications
- Provides consistency in testing, regardless of who performs the test



For a Tutorial on how to use DataView with the PowerPad, visit our Power Quality category in our “Tech Info” section on our website - www.aemc.com.

7.2 Installing DataView®

DO NOT CONNECT THE INSTRUMENT TO THE PC BEFORE INSTALLING THE SOFTWARE AND DRIVERS.

Minimum Computer Requirements:

- Windows XP / Windows Vista & Windows 7 (32/64 bit)
- 256MB of RAM for Windows XP
1GB of RAM for Windows Vista & Windows 7 (32 bit)
2GB or RAM for Windows Vista & Windows 7 (64 bit)
- 80MB of hard disk space (200MB recommended)

Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

NOTE: When installing, the user must have Administrative access rights during the installation. The users access rights can be changed after the installation is complete.

DataView® must be reinstalled for each user in a multi-user system.

1. Insert the DataView® CD into your CD-ROM drive.

If auto-run is enabled, the Setup program will start automatically. If auto-run is not enabled, select Run from the Start menu and type in **D:\SETUP** (if your CD-ROM drive is drive D. If this is not the case, substitute the appropriate drive letter).



If installing onto a Vista based computer the **User Account Control** dialog box will be displayed. Select the **Allow** option to proceed.

2. A **Set-up** window, similar to the one below, will appear.

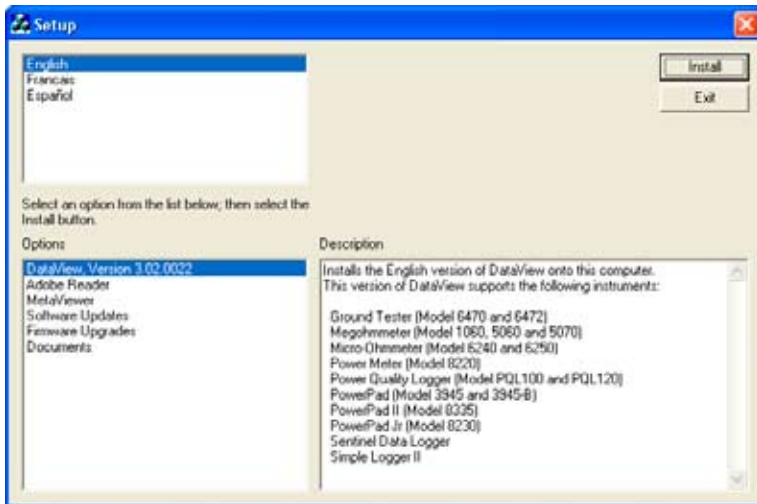


Figure 7-1

There are several different options to choose from. Some options^(*) require an internet connection.

- **DataView, Version x.xx.xxxx** - Installs DataView® onto the PC.
- ***Adobe Reader** - Links to the Adobe® website to download the most recent version of Adobe® Reader to the computer. *Adobe® Reader is required for viewing PDF documents supplied with DataView® that are accessible from the Help menu.*

- **MetaViewer** - The MetaViewer utility program allows a user to view and print .dmf or .emf files generated by DataView® without having DataView® software installed.
 - ***Software Updates** - Links to the AEMC® Software Update website to check for new software version releases.
 - ***Firmware Upgrades** - Links to the AEMC® Firmware Upgrade website to check for new firmware version releases.
 - **Documents** - Shows a list of instrument related documents that you can view. Adobe® Reader is required for viewing PDF documents supplied with DataView®.
3. **DataView, Version x.xx.xxxx** option should be selected by default. Select the desired language and then click on **Install**.
 4. The **Installation Wizard** window will appear. Click **Next**.
 5. To proceed, accept the terms of the license agreement and click **Next**.
 6. In the **Customer Information** window, enter a Name and Company, then click **Next**.
 7. In the **Setup Type** window that appears, select the **“Complete”** radio button option, then click **Next**.
 8. In the **Select Features** window that appears, select the instrument’s control panel that you want to install, then click **Next**.



The **PDF-XChange** option must be selected to be able to generate PDF reports from within DataView®.

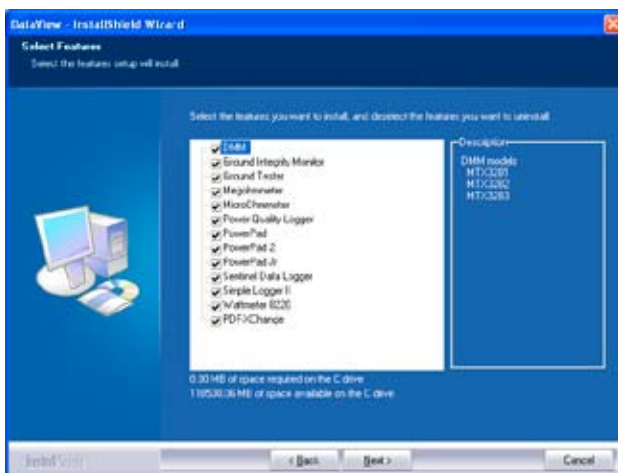


Figure 7-2

9. In the **Ready to Install the Program** window, click on **Install**.
10. If the feature selected for installation requires the use of a USB port, a warning box will appear, similar to Figure 7-3. Click **OK**.

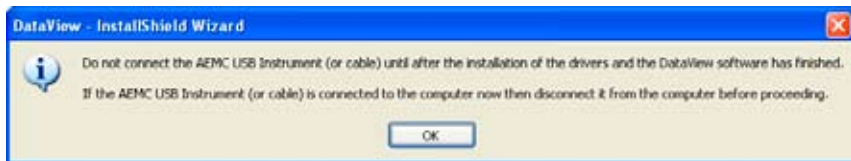




Figure 7-3


 The installation of the drivers may take a few moments. Windows may even indicate that it is not responding, however it is running. Please wait for it to finish.

12. When the drivers have finished installing, the **Installation Wizard Complete** window will appear. Click on **Finish**.
14. A **Question** dialog box appears next. Click **Yes** to read the procedure for connecting the instrument to the USB port on the computer.

 The Set-up window remains open. You may now select another option to download (e.g. Adobe® Reader), or close the window.

15. **Restart** your computer, then connect the instrument to the USB port on the computer.
16. Once connected, the **Found New Hardware** dialog box will appear. Windows will complete the driver installation process automatically.

Shortcuts for DataView® and each instrument control panel selected during the installation process have been added to your desktop.

 If you connected your instrument to the computer before installing the software and drivers, you may need to use the **Add/Remove Hardware** utility to remove the instrument driver before repeating the process.

7.3 Connecting the PowerPad® to your Computer

The PowerPad® is supplied with a USB cable required for connecting the instrument to the computer.

To connect the PowerPad® to your computer:

1. Connect USB cable to the port on the side panel of the PowerPad®.
2. Connect the other end of the USB cable to a USB port on your computer.
3. Turn the PowerPad® on (for the Control Panel to work, the PowerPad® must be on at all times when in use).

You are now ready to use the DataView® software with the PowerPad®.

7.4 Opening the Control Panel

To open the Power Analyzer Control Panel:

- Double-click the **PowerPad** Icon that was created during installation, located on the desktop.
- The **Connection** window will appear (see Figure 7-5).

Once the communication link is established, DataView® will automatically identify the instrument that it is connected to.

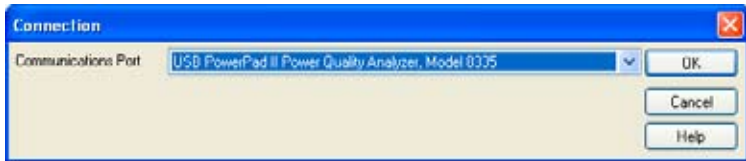


Figure 7-5

- Make sure the communications port displayed in the dialog box matches the instrument you plugged the USB cable into. If the correct port is not selected, click on the drop-down menu to select it.



For detailed instructions and descriptions for any feature in a dialog box, click on the **Help Button**, or **right-click on the feature** you want information about.

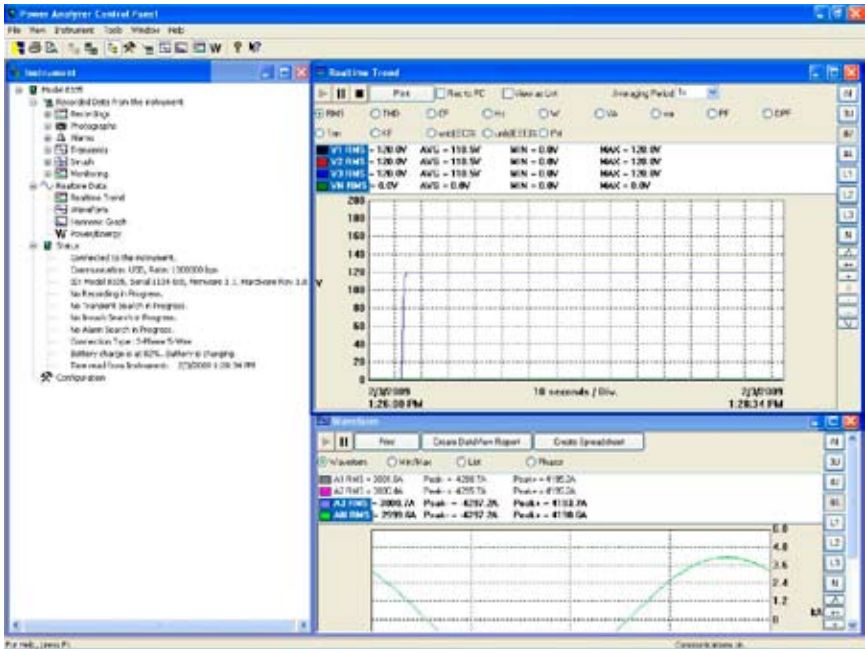


Figure 7-6

The Control Panel displays:

- Recorded Data from the instrument
- Realtime Data
- Connection status
- The communications port and speed of the connection
- The model number, serial number, firmware and hardware revision
- The battery charge level, whether the battery is charging or discharging, and the time on the clock
- If a recording is in progress and when it is scheduled to end
- If a delayed recording is scheduled and when it is scheduled to begin
- Connection type (Electrical Hookup)

If the indicated items are not shown on the screen, select **Restore Default Layout** from the Window menu.



If the battery charge is shown to be unknown, plug the PowerPad® into AC Power. When it reaches 100% charge, the display should again be able to show the battery charge.

7.5 Common Functions

The buttons described below appear on several DataView® Setup Screens.

- **Re-Read from Instrument:** Reads the current configuration of the PowerPad® attached via the serial cable.
- **Save to File:** Saves the current configuration. This file will reside on the computer's disk drive. Saving different configuration setups can be useful for future functions and tests.
- **Load from File:** Retrieves a saved file from the computer's disk drive to be used in programming the PowerPad®.
- **OK:** Closes the dialog box while saving the current configuration and returns to the Control Panel.
- **Cancel:** Exit without saving configuration.
- **Apply:** Programs the PowerPad® using the current settings without closing the window.
- **Help:** Opens the online Help.

7.6 Configuring the Instrument

The Configure dialog box lets you configure every aspect of the PowerPad®. Each field is identical to the programmable features available from the instrument's front panel itself.

Several of the functions are configured by typing the appropriate value in the field provided. Others are configured by clicking on the appropriate radio button or Icon, such as, selecting the current probe.

To configure the instrument, go to **Instrument > Configure** or select **Configuration** from the Instrument Tree.

7.6.1 Setup

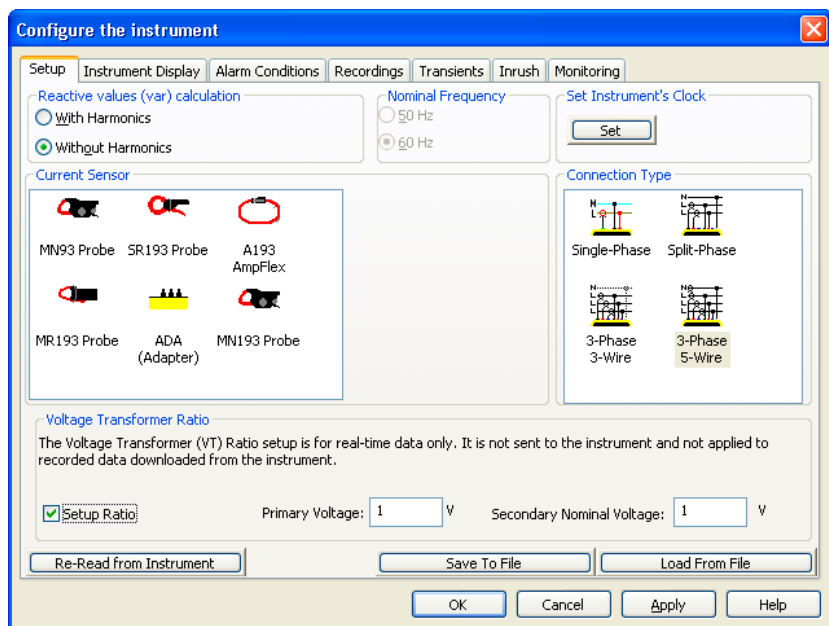


Figure 7-7

- **Reactive Values Calculation:** With or without harmonics. Applies to VAR calculation.
- **Nominal Frequency:** 50 or 60Hz. This parameter determines the correction coefficients used for calculating power and energy.
- **Current Sensor:** MN93, MN193, SR193, MR193, A193 AmpFlex®, MiniFlex™ or ADA Adapter (used to accept probes with other ratios or a direct 1 Amp or 5 Amp input)
- **Connection Type:** Single-Phase, Two-Phase (Split Phase), 3-Phase 3 wire or 3-Phase 5 wire.
- **Set Instrument's Clock:** Resets the time and date on the PowerPad® to that of the computer or a desired setting.
- **Voltage Transformer Ratio:** Sets the scale for voltage measurement in cases where measurements are on the secondary side of a transformer and the primary value needs to be displayed.

7.6.2 Instrument Display

The Instrument Display tab allows you to customize the display (colors, clock, language and contrast).

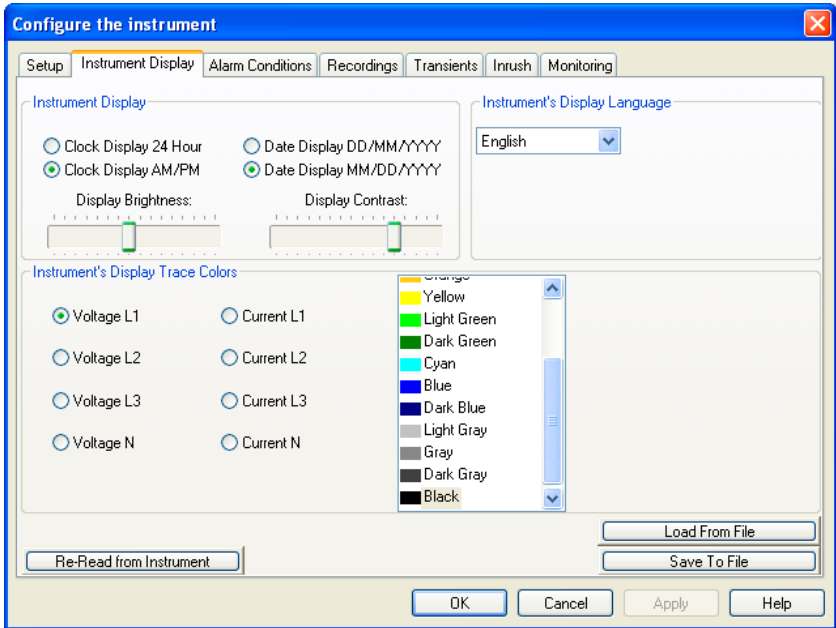


Figure 7-8



For detailed instructions and descriptions for any feature in a dialog box, click on the **Help Button** (lower right-side of the dialog box), or **right-click on the feature** you want information about.

7.6.3 Alarm Conditions Configuration

The Alarm Conditions tab allows you to set up 40 alarm configurations.

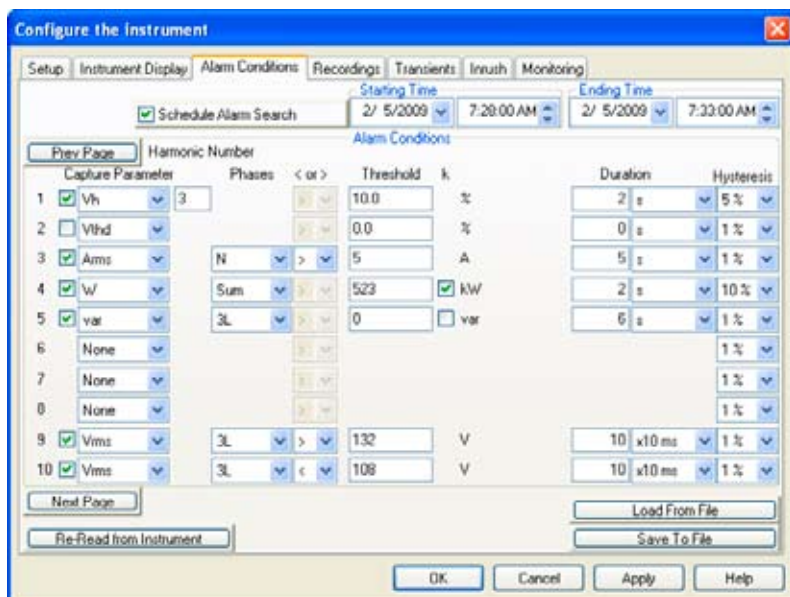


Figure 7-9

- **Schedule Alarm Search:** Check this box to activate the alarms, and set a starting and ending time and date to assign the time period during which the alarms will be active.
- **Prev Page & Next Page:** Move between the 4 pages of alarms with 10 alarms per page.
- **Capture Parameter:** The Alarm will be triggered based on the value of the selected parameter.

Choices include:

None: no alarm

Vrms: voltage root mean squared

Urms: voltage phase minus phase root mean squared

Arms: current root mean squared

VPST: voltage short term flicker

Vcf: voltage crest factor

Ucf: voltage phase minus phase crest factor

Acf: current crest factor

Vunb: voltage unbalance

Aunb: current unbalance

H: frequency

Akf: current K factor

Vthd: voltage total harmonic distortion

Uthd: voltage phase minus phase total harmonic distortion

Athd: current total harmonic distortion

W: active power

- **Harmonic Number:** For alarm parameters, Vh, Ah, Uh, and VAh, selects which harmonic number is being used as an alarm condition. For example, Vh with a harmonic number of 2, will only look at Voltage phase to neutral, harmonic 2.
- **Phases:** Some alarm conditions have a phase selection. W, VAR, and VA, have a choice of “3L” (each individual phase), or “Sum” which is the sum of phases. DPF, PF, and TAN have the choice of “3L” (each individual phase), or “Mean” which is the mean of phases.
- **Threshold:** The value that must be reached to start an alarm. For “>” alarms, the value or higher must be reached, for “<” alarms, the value or lower must be reached.
- **Duration:** The Alarm will only be recorded if the duration of the parameter meeting the threshold criteria exceeds the duration. The minimum alarm duration can be in minutes or seconds. In the case of Vrms, Urms or Arms not using neutral current, can also be in hundredths of a second. For Vrms, Urms, and Arms, it can be useful to set a duration of 0 seconds. In that case an event as short as a half cycle can be detected (8 milliseconds at 60Hz). For all other parameters, the minimum duration that can be detected is 1 second.
- **Hysteresis:** This value for alarms is set to prevent multiple recordings of an event that goes above the threshold and a certain percentage below it at times.

Example: Alarm threshold is 100 Volts or higher, hysteresis is 1%. When the voltage goes up to 100V, the alarm condition starts. When it goes back down to 99V, the alarm condition stops.

NOTE: You can configure alarms, recordings, inrush, and transient searches while testing is in progress.

7.6.4 Recordings Configuration

The Recordings tab shows the parameters for a recording session.

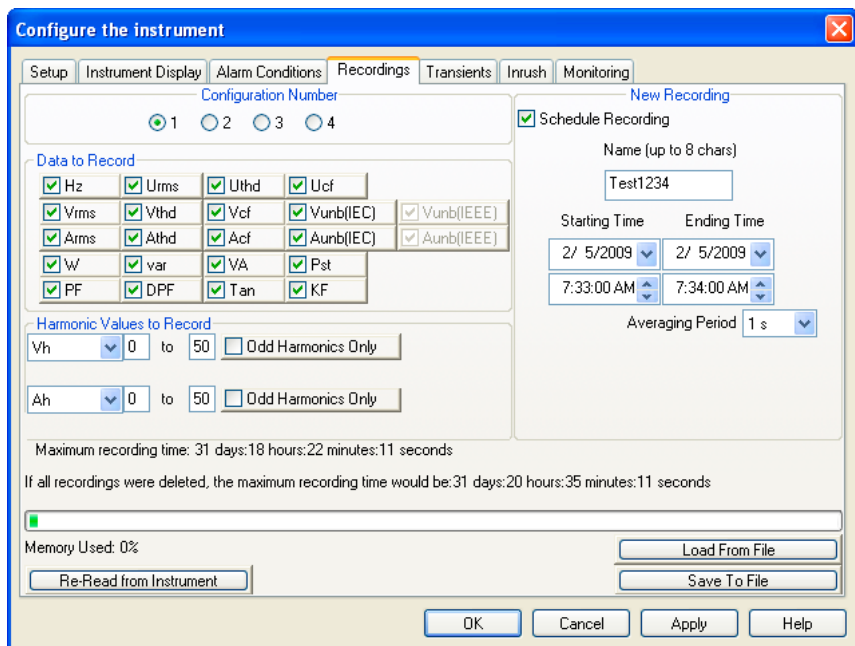


Figure 7-10

Four different configurations are available. More configurations can be saved by pressing **“Save to File”** and recalled later by pressing **“Load From File”**.

1. Select the configuration to set up: 1, 2, 3 or 4.
2. Check the box for each parameter desired in the **“Data to Record”** section.
3. Configure the harmonic values to be recorded, if desired.
It is possible to record up to 2 of 4 types of harmonic data, voltage (Vh), current (Ah), phase to phase voltage (Uh), and power (VAh). For each selected harmonic data type, you can choose a range of harmonics to record from the 1st to 50th. You can further limit that range to only include odd numbers by checking the box for **“Odd Harmonics Only”**.
4. Check the box next to **“Schedule Recording”** to activate the recording function. Choose a starting and ending time to assign a time period for the recording to run. Enter a name for the recording (up to 8 characters), if desired.
5. Choose an **“Averaging Period”** for the recording, which sets how often the recording updates while it is running.



The PowerPad® loses its scheduled recording if it is powered off before the recording begins. If it is powered off during the recording, a partial recording will usually still exist but with the first letter of its name changed to “@”. The start and end times requested for the recording might be adjusted by the PowerPad® to be in even multiples of the averaging period. For instance, if an integration period of 10 minutes was requested, and the start time was 9:03, the recording might not actually begin until 9:10.

7.6.5 Transients

The Transients tab allows you to set up the criteria for capturing transients.

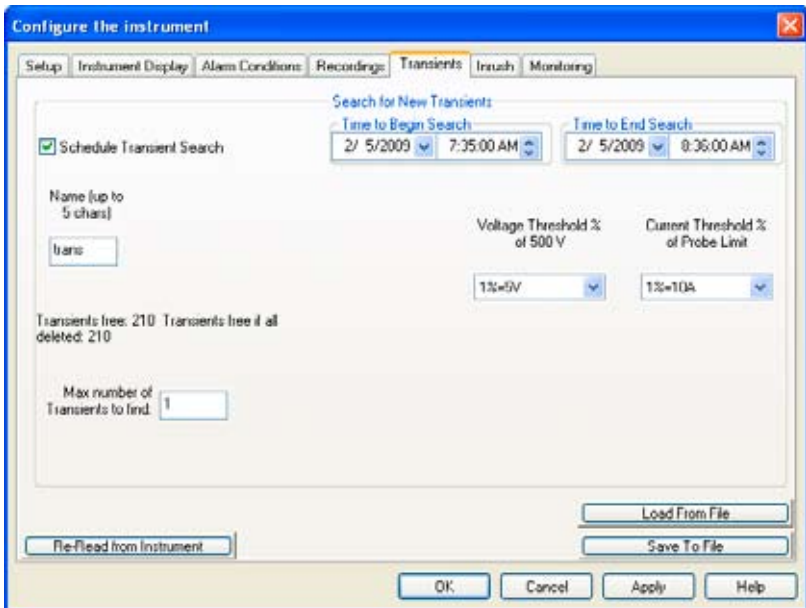


Figure 7-11

1. Click the box next to “**Schedule Transient Search**” to activate the transient search function.
2. Type a name for the session, up to five characters.
3. Select the date and time to begin and end the search for transients.
4. Select the percent deviation for voltage and current transients. The choices available from the drop-down menu are 1, 2, 5, 10, 20, 50 and 100% of the full scale range of measurement.
5. Select the maximum number of transients to capture (from 1 to 210).

7.6.6 Inrush

The Inrush tab shows the dialog box used to configure the parameters for an Inrush search.

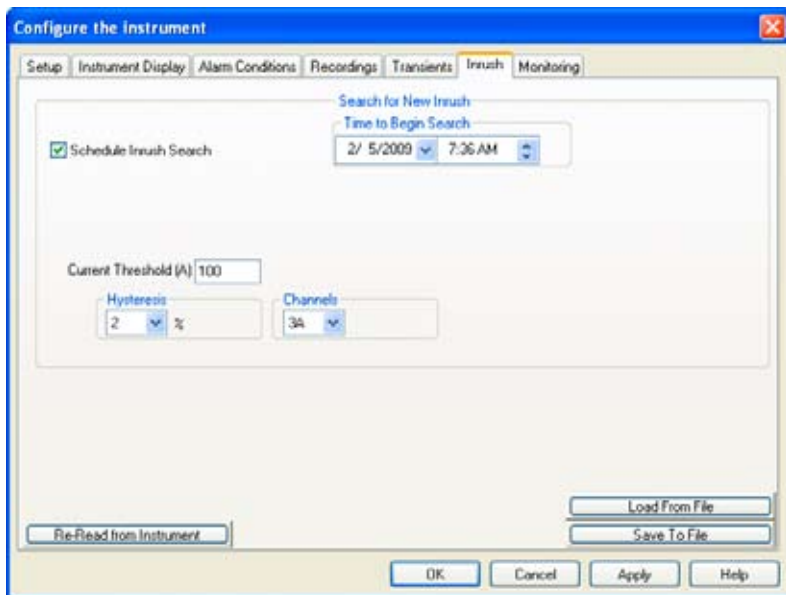


Figure 7-12

1. Click the box next to **Schedule Inrush Search** to activate the function
2. Set a time and date for the search to begin.
3. Assign a **Current Threshold** in Amps, to trigger the inrush recording.
4. Select the **Channel** to run the Inrush search on. The search can be performed on one of the three current channels (A1, A2, A3) or all three (3A).
5. Select a **Hysteresis** percentage.

7.6.7 Monitoring

The EN50160 standard defines limiting values and permissible variations of the voltage quality for the European Community. It defines which parameters are relevant, and how are they measured. Continuous or random sampling control of the voltage quality provides the supplier of electric energy with a reliable basis when dealing with network problems, and it contributes to quality assurance.

The purpose of the EN50160 standard “Voltage characteristics of electricity supplied by public distribution systems” is to specify the characteristics to the customer of the supply voltage with regard to the course of the curve, the voltage level, the frequency and symmetry of the three phase-network at the interconnecting point. The goal is to determine limiting values for regular operating conditions.

However, facility defects may lead to major disturbances in the electricity distribution supply network. Accordingly, the standard establishes these values as limiting values, which are not allowed to be exceeded on the high or low side during 95% of the controlled period, typically one week.

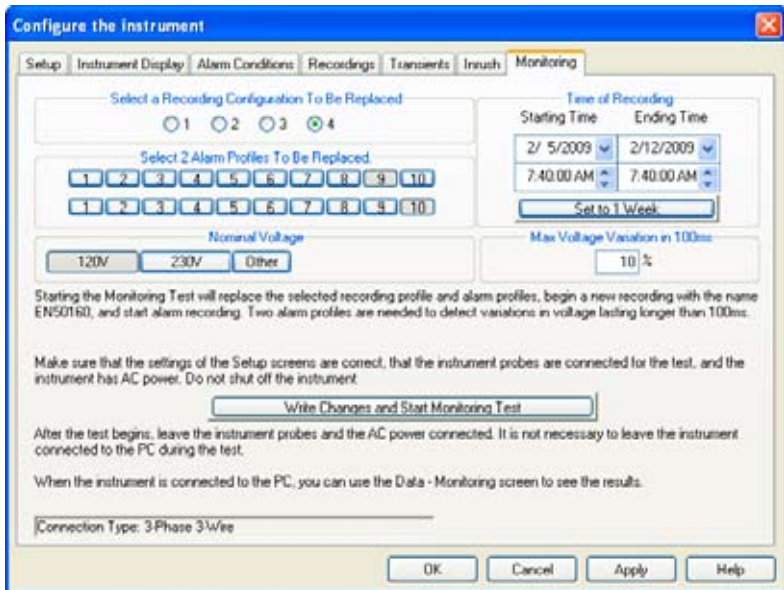


Figure 7-13

Configure and start an EN50160 test of line quality. Note that It is recommended that a brief test of 10 minutes or shorter be done first, to verify that the connections and parameters of the test are correct. Only then should the 1-week test be done.

If neither of the voltage profiles are chosen, a field appears to enter the nominal voltage. The frequency is not asked for, since it will be asked for when the test result is downloaded.

Follow the instructions in the dialog box to set up and run this special test. Press the Help button for further instructions.

7.6.8 Running the Test

After configuring the instrument, press “OK”. The status window will display if a recording is ready to start. Select “Yes” to run the scheduled testing, select “No” to close the Configure dialog box and cancel the testing.

7.7 Real-time Windows

When your setup is completed, you can display different views on the screen of real-time data and waveforms.

7.7.1 Waveform and Harmonic Graph

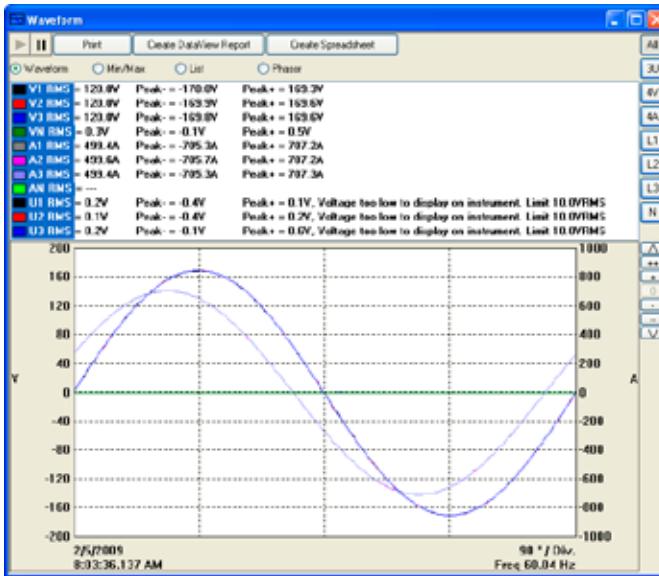


Figure 7-14

- Select the type of data to see.
- Stop the update with the Hold (Pause) button. Resume with the Start (Play) button.
- Print the screen selected.
- Save the data by choosing either **Create DataView Report** to view the data in a DataView® report or **Create Spreadsheet** to view in a Spreadsheet program (e.g. Microsoft® Excel).

7.7.2 Power/Energy

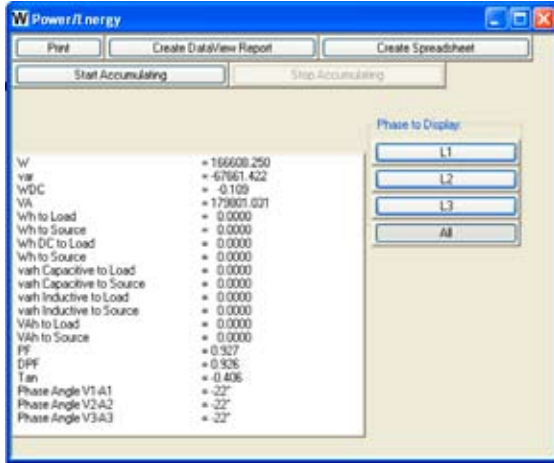


Figure 7-15

The Power/Energy window displays accumulated power and energy data.

Accumulated energy data can be started or stopped and the results can be downloaded to a database and viewed on the screen, selected by phase.



The data for all available phases are downloaded to a database or spreadsheet, not just what is shown on the screen.

7.7.3 Trend

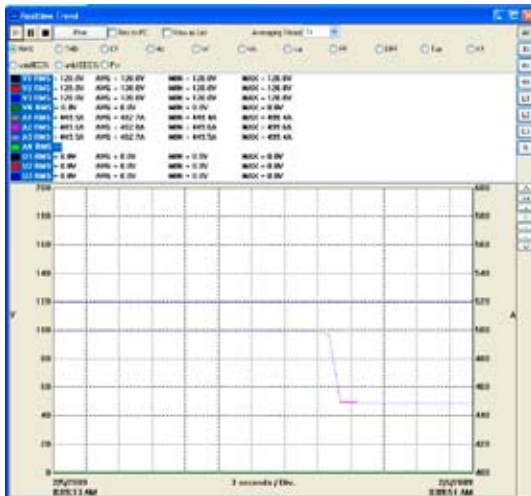


Figure 7-16

Shows a real-time trend of data from the PowerPad®. The data is an average of waveforms downloaded to the PC whose scale adjusts constantly to fit all the data it has received.

7.8 Downloading Data

To download recorded data, go to **Instrument > Recorded Data**, recorded data can also be found from the Instrument tree view. Expand the sections under **“Recorded Data from the Instrument”** then click on a line that describes the desired recorded data. It will bring up a window with a graph of the data.

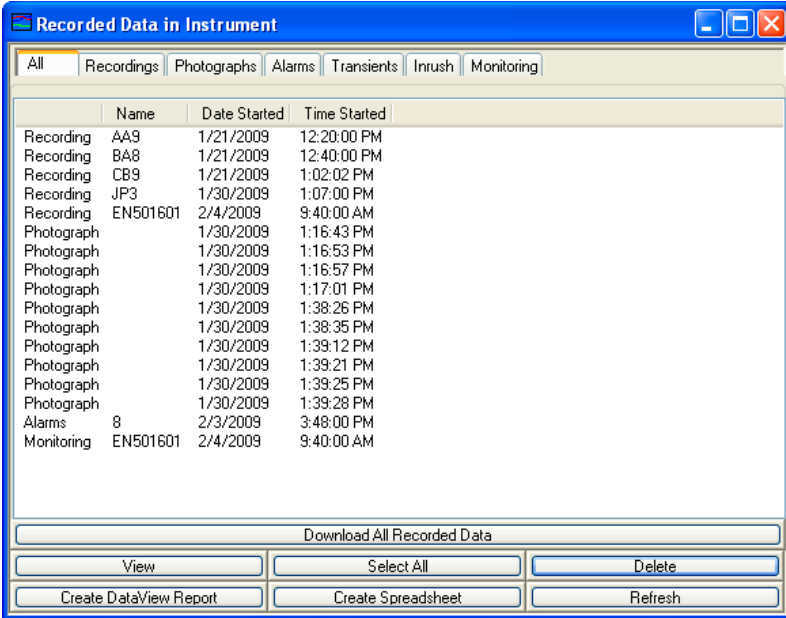


Figure 7-17

- Select the data you want to download by clicking on the desired tab (Recordings, Photographs, etc.), then clicking on the file name.
- You can choose to view the data in three different ways:
 - **“Create DataView Report”** inserts the data into a DataView® report which can then be viewed, modified and saved.
 - **“Create Spreadsheet”** saves the data in a Microsoft® Excel spreadsheet (.csv file) which can then be viewed, modified and saved.
 - **“View”** opens up a window with a graph of the data where the user can select to **“Print”**, **“Create DataView Report”**, and **“Create Spreadsheet”**.

- From the “**Recorded Data**” window it is possible to delete files stored on the PowerPad® using the “**Delete**” button
- The “**Download All Recorded Data**” button allows the user to download and save all the files on the PowerPad® for later viewing and analysis.
- Recorded data can also be found from the Instrument tree view. Expand the sections under “**Recorded Data from the Instrument**” then click on a line that describes the desired recorded data. It will bring up a window with a graph of the data.

Recordings:

The Recording tab displays a list of recordings within the PowerPad®.

These recordings can be selected and downloaded to a database.

Photographs:

The Photographs tab displays a list of photographs (snapshots), with the date and time, taken when the camera button was pressed.

When “**View**” is selected, it shows the waveforms, power data and Bitmap image of the PowerPad® screen from the time the camera button was pressed.



Snapshots can only be initiated using the camera button on the PowerPad® itself, not by DataView®.

Alarms:

The Alarms tab displays the alarm search that was recorded to the PowerPad®. Details on the alarm search are available by clicking on the desired alarm set, which opens up an alarm window with the searches details. Alarm search data can be selected and downloaded to a Spreadsheet or a DataView® Report by clicking the corresponding buttons.

Transients:

The Transients tab displays transients stored on the PowerPad®. It shows the number and name of the recording, and the time it began and ended. The selected transient(s) can either be downloaded or deleted.

The downloaded result contains many waveforms. Use the controls “><” and “<>” located at the lower right corner of the window, to zoom in or out of the data.

These controls are available in every graph from recorded data.

There is also a checkbox, “**View As List**”, which can be used to show the value of every datapoint.

Inrush:

The Inrush tab displays recorded Inrush data that is stored on the PowerPad®.

Monitoring:

The Monitoring tab displays recorded tests that can be downloaded and analyzed.

After selecting a recording and clicking **“View”**, the summary window appears showing the results after all the data has been downloaded to a database. It displays the name, percent of the 10-minute periods that it has been out of range, followed by the range it needed to be within.

7.9 Saving Real-time Measurements

Real-time data received from an instrument can be saved directly into a recording session database. This differs from the process of downloading and saving recorded data in that the measurements are stored on the computer as the instrument measures them. These measurements are not necessarily being stored within the instrument. However, the instrument may be configured to record at the same time real-time measurements are being received from the instrument. In which case, two copies of the measurements will be stored. One copy is stored on the local computer and the other in memory within the instrument.

To Save a Real-time Measurement:

1. From the Realtime Trend window, check the **“Rec to PC”** checkbox.
2. In the Save As dialog box that appears, specify the type of file to save in the **“Save as Type”** field. The choices are .dwb (DataView database), .xls (Excel spreadsheet), or .csv (Comma Separated File). Specify the name of the file by typing it into the File name field, select the desired location to save the file, then click Save to save the file.
3. When the **“Rec to PC”** option is unchecked the file can be opened by selecting **“Yes”** from the View Saved File dialog box.

To edit the Session Properties, return to the Power Analyzer Control Panel and select **File > Edit Session Properties**.

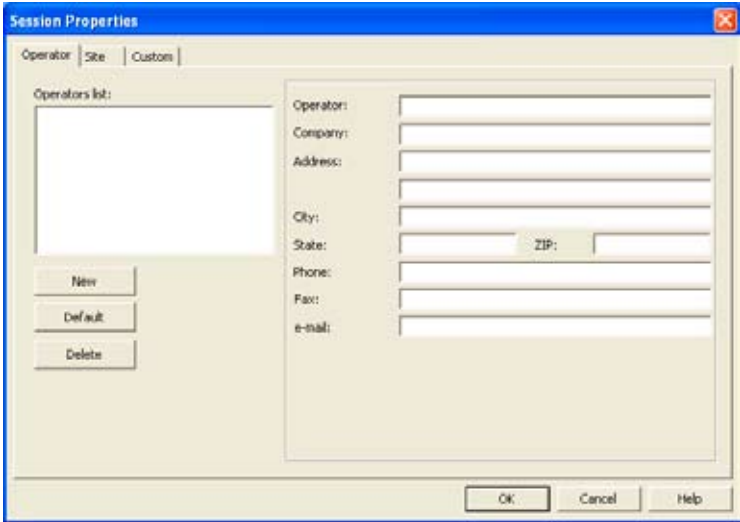


Figure 7-18

The Session Properties dialog box allows you to specify the Operator, Site and Custom parameters that are to be saved with recorded data. These parameters are used when generating reports.

The Operator and Site tabs allow you to maintain lists of operators and sites, saving you time when specifying parameters for reports.

On the left of the Operator and Site tabs is the list of previously defined Operators and Sites. On the right of the Operator and Site tabs is the individual parameters that will be saved in an associated database. Only a single set of operator and site fields are saved in the recording database.

The Custom tab contains a list of user defined parameters. Along side each user defined parameter is a check box. Items that are checked will be added to an associated database. Only a single set of Custom parameters can be maintained (unlike the Operator and Site lists). The Custom tab allows you to specify any user defined parameters (in addition to the comments field of the Site tab) that are to be used in displaying a report.



In addition to the pre-designed report templates, DataView® allows you to totally configure reports to your needs. **Refer to the DataView® HELP file on “Templates” to learn more about templates.**

MAINTENANCE

Use only factory specified replacement parts. AEMC® will not be held responsible for any accident, incident, or malfunction following a repair done other than by its service center or by an approved repair center.



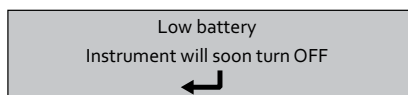
Before first use, charge and discharge the instrument one or two cycles to ensure the proper level display of the battery indicator.


8.1 Battery Indicator

The number of bars in the battery icon located in the upper right of the screen shows the battery level.

Icon	Battery Charge Status
	Battery charged
	Low battery
	Battery charging
	The PowerPad® is being powered by the power cord

When the capacity of the battery is too low, the following message is displayed:



Press  to confirm. The PowerPad® will shut off after one minute if you do not connect the PowerPad® to the power cord.



The battery may fully discharge when recording for long periods of time while not connected to a power supply. The PowerPad® will continue to record for some time, even if below the minimum battery charge value. However, the display may not come back on, and will eventually stop saving data when the battery is too low. All data recorded will be saved. During the recording, the ON/OFF button will blink. If the light is not blinking, the recording has stopped and the data has been saved. Do not turn the instrument OFF. Supply power to the PowerPad® with the power cord and press the ON/OFF button.

8.2 Recharging the Battery

Battery life is 10 hours when the battery is completely charged and no recording is in progress. Battery life is approximately 35 hours when recording and the display is off.

The batteries automatically begin recharging when the PowerPad® is connected to the AC power supply. Only use the supplied AC power supply to recharge the batteries of the PowerPad®. It will take about 5 hours to fully charge completely drained batteries. The batteries will not be depleted when the unit is connected to the power supply.



The instrument will not recharge if the message “Instrument will soon turn OFF” is displayed on the screen. The Enter button must be pressed or the instrument must be turned OFF before recharging will start.

8.3 Changing the Battery



WARNING:

- When changing the battery, disconnect all instrument inputs and turn the equipment off. There must be a delay of at least one minute without the battery being connected.
- Do not expose the battery to heat exceeding 212°F (100°C)
- Do not short-circuit the battery terminals

To change the battery, disconnect from any input and make sure the instrument is turned off.

With a coin, remove back panel and replace with a 9.6V NiMH factory supplied battery pack.

NOTE: The memory card is accessible when the battery is removed from the compartment.

8.4 Cleaning



Disconnect the instrument from any source of electricity.

- Use a soft cloth, lightly dampened with soapy water
- Wipe with a damp cloth and then dry with a dry cloth
- Do not splash water directly on the clamp
- Do not use alcohol, solvents or hydrocarbons

APPENDIX A

MATHEMATICAL FORMULAS FOR VARIOUS PARAMETERS

Half-period Voltage and Current RMS Values

$$V_{dem}[i] = \sqrt{\frac{1}{NSHC} \cdot \sum_{n:Zero}^{Next\ Zero} V[i][n]^2} \quad \text{Single rms voltage half-period } i + 1 \text{ phase}$$

$$U_{dem}[i] = \sqrt{\frac{1}{NSHC} \cdot \sum_{n:Zero}^{Next\ Zero} U[i][n]^2} \quad \text{Compound rms voltage half-period } i + 1 \text{ phase}$$

$$A_{dem}[i] = \sqrt{\frac{1}{NSHC} \cdot \sum_{n:Zero}^{Next\ Zero} A[i][n]^2} \quad \text{Rms current half-period } i + 1 \text{ phase}$$

NSHC: number of samples per half cycle (between two consecutive zeros)

n: sample (0; 255)

i: phase (0; 1; 2)

MIN / MAX Values for Voltage and Current

$$V_{max}[i] = \max(V_{dem}[i]), \quad V_{min}[i] = \min(V_{dem}[i]), \quad V_{avg} = 1/6000 \sum V_{dem}[i]$$

$$U_{max}[i] = \max(U_{dem}[i]), \quad U_{min}[i] = \min(U_{dem}[i]), \quad A_{avg} = 1/6000 \sum A_{dem}[i]$$

$$A_{max}[i] = \max(A_{dem}[i]), \quad A_{min}[i] = \min(A_{dem}[i]) \quad (\text{Avg calculation on } 1s)$$

Peak Values for Voltage and Current (Updated on each waveform refresh)

$$V_{pp}[i] = \max(V[i][n]), V_{pm}[i] = \min(V[i][n]), n \in [0..NSC-1]$$

$$U_{pp}[i] = \max(U[i][n]), U_{pm}[i] = \min(U[i][n]), n \in [0..NSC-1]$$

$$A_{pp}[i] = \max(A[i][n]), A_{pm}[i] = \min(V[i][n]), n \in [0..NSC-1]$$

NSC: number of samples per cycle

Peak Factors for Current and Voltage

$$V_{cf}[i] = \frac{\max(V_{pp}[i], V_{pm}[i])}{\sqrt{\frac{1}{NSC} \cdot \sum_{n=0}^{NSC-1} V[i][n]^2}} \quad \text{Peak factor single voltage } i + 1 \text{ phase}$$

$$U_{cf}[i] = \frac{\max(U_{pp}[i], U_{pm}[i])}{\sqrt{\frac{1}{NSC} \cdot \sum_{n=0}^{NSC-1} U[i][n]^2}} \quad \text{Peak factor phase-phase voltage } i + 1 \text{ phase}$$

$$A_{cf}[i] = \frac{\max(A_{pp}[i], A_{pm}[i])}{\sqrt{\frac{1}{NSC} \cdot \sum_{n=0}^{NSC-1} A[i][n]^2}} \quad \text{Peak factor current } i + 1 \text{ phase}$$

1 sec RMS Values for Voltage and Current

$$V_{rms}[i] = \sqrt{\frac{1}{NSS} \cdot \sum_{n=0}^{NSS-1} V[i][n]^2} \quad \text{Single rms voltage } i + 1 \text{ phase}$$

$$U_{rms}[i] = \sqrt{\frac{1}{NSS} \cdot \sum_{n=0}^{NSS-1} U[i][n]^2} \quad \text{Compound rms voltage } i + 1 \text{ phase}$$

$$A_{rms}[i] = \sqrt{\frac{1}{NSS} \cdot \sum_{n=0}^{NSS-1} A[i][n]^2} \quad \text{Rms current } i + 1 \text{ phase}$$

NSS: number of samples in a second (multiple of NSC)

Voltage and Current Unbalance

$$V_+ = \frac{1}{3} (VFrms[0] + a \cdot VFrms[1] + a^2 \cdot VFrms[2]) \quad \text{Direct voltage (complex notation } a = e^{j\frac{2\pi}{3}} \text{)}$$

$$V_- = \frac{1}{3} (VFrms[0] + a^2 \cdot VFrms[1] + a \cdot VFrms[2]) \quad \text{Reve}$$

$$V_{unb} = \frac{|V_{rms-}|}{|V_{rms+}|}, \quad A_{unb} = \frac{|A_{rms-}|}{|A_{rms+}|}$$

THD Calculation (no neutral)

$$V_{thd}[i] = \frac{\sqrt{\sum_{n=2}^{50} V_{harm}[i][n]^2}}{V_{harm}[i][1]}, \quad U_{thd}[i] = \frac{\sqrt{\sum_{n=2}^{50} U_{harm}[i][n]^2}}{U_{harm}[i][1]}, \quad A_{thd}[i] = \frac{\sqrt{\sum_{n=2}^{50} A_{harm}[i][n]^2}}{A_{harm}[i][1]}$$

i: phase (0; 1; 2) n: range (2 to 50)

Calculation of Harmonic Bins

Harmonic bins are calculated by FFT with 16 bit resolution (1024 samples on 4 cycles) without windowing (IEC 1000-4-7). From real and imaginary components, each bin ratio is calculated on each phase $V_{\text{harm}}[3][51]$, $U_{\text{harm}}[3][51]$ and $A_{\text{harm}}[3][51]$ in proportion to the fundamental value and the phase angles $V_{\text{ph}}[3][51]$, $U_{\text{ph}}[3][51]$ and $A_{\text{ph}}[3][51]$ between each bin and the fundamental.

This calculation is accomplished using the following principle:

$$\text{module in \%: } \text{mod}_k = \frac{c_k}{c_1} \times 100 \qquad \text{angle in degree: } \varphi_k = \arctan \left(\frac{a_k}{b_k} \right)$$

$$\text{with } \begin{cases} c_k = |b_k + ja_k| = \sqrt{a_k^2 + b_k^2} \\ b_k = \frac{1}{512} \sum_{s=0}^{1024} F_s \times \sin \left(\frac{k\pi}{512} s + \varphi_k \right) \\ a_k = \frac{1}{512} \sum_{s=0}^{1024} F_s \times \cos \left(\frac{k\pi}{512} s + \varphi_k \right) \\ c_0 = \frac{1}{1024} \sum_{s=0}^{1024} F_s \end{cases}$$

ck: amplitude of the component with a frequency of $f_k = \frac{k}{4} f_1$

Fs: sampled signal

co: DC component

k: ordinal number (spectral bin)

Distortion Factor Calculation (DF)

Two global values giving the relative quantity of harmonics are computed: the THD in proportion to the fundamental and the DF in proportion to the RMS value.

$$V_{thd}[i] = \frac{\sqrt{\sum_{n=2}^{50} V_{harm}[i][n]^2}}{V_{harm}[i][1]}, \quad U_{thd}[i] = \frac{\sqrt{\sum_{n=2}^{50} U_{harm}[i][n]^2}}{U_{harm}[i][1]}, \quad A_{thd}[i] = \frac{\sqrt{\sum_{n=2}^{50} A_{harm}[i][n]^2}}{A_{harm}[i][1]}$$

$$V_{df}[i] = \frac{\sqrt{\frac{1}{2} \sum_{n=2}^{50} V_{harm}[i][n]^2}}{V_{rms}[i]}, \quad U_{df}[i] = \frac{\sqrt{\frac{1}{2} \sum_{n=2}^{50} U_{harm}[i][n]^2}}{U_{rms}[i]}, \quad A_{df}[i] = \frac{\sqrt{\frac{1}{2} \sum_{n=2}^{50} A_{harm}[i][n]^2}}{A_{rms}[i]}$$

Multiplying the voltage harmonic factor with the current harmonics factor gives the power harmonic factor. Differentiating voltage harmonic phase angle with current harmonic phase angle gives power harmonic phase angle.

$V_{Aharm}[3][51]$, $V_{Aph}[3][51]$

K Factor

$$A_{kf}[i] = \frac{\sum_{n=1}^{n=50} n^2 A_{harm}[i][n]^2}{\sum_{n=1}^{n=50} A_{harm}[i][n]^2} \quad \text{K factor for the } i + 1 \text{ phase}$$

Different Power Levels 1 Sec (no neutral)

$$W[i] = \frac{1}{NSS} \sum_{n=0}^{NSS-1} V[i][n] \cdot A[i][n] \quad \text{Active power } i + 1 \text{ phase}$$

$$VA[i] = Vrms[i] \cdot Arms[i] \quad \text{Apparent power } i + 1 \text{ phase}$$

$$VAR[i] = \frac{1}{NSS} \sum_{n=0}^{NSS-1} VF[i][n - NSC / 4] \cdot AF[i][n] \quad \text{Reactive power } i + 1 \text{ phase}$$

or $VAR[i] = \sqrt{VA[i]^2 - W[i]^2}$ if computation method is with harmonics

$W[3] = W[0] + W[1] + W[2]$	Total active power
$VA[3] = VA[0] + VA[1] + VA[2]$	Total apparent power
$VAR[3] = VAR[0] + VAR[1] + VAR[2]$	Total reactive power

Ratios

$$PF[i] = \frac{W[i]}{VA[i]} \quad i + 1 \text{ phase power factor}$$

$$DPF[i] = \cos(\phi[i]) \quad i + 1 \text{ phase displacement factor}$$

$$\text{Tan}[i] = \tan(\phi[i]) \quad i + 1 \text{ phase tangent}$$

$$\cos(\phi[i]) = \frac{\sum_{n=0}^{NSS-1} VF[i][n] \cdot AF[i][n]}{\sqrt{\sum_{n=0}^{NSS-1} VF[i][n]^2} \sqrt{\sum_{n=0}^{NSS-1} AF[i][n]^2}} \quad \text{Cosine angle between voltage fundamental and } i + 1 \text{ phase current}$$

$$PF[3] = \frac{PF[0] + PF[1] + PF[2]}{3} \quad \text{Total power factor}$$

$$DPF[3] = \frac{DPF[0] + DPF[1] + DPF[2]}{3} \quad \text{Total shift factor}$$

$$\text{Tan}[3] = \frac{\text{Tan}[0] + \text{Tan}[1] + \text{Tan}[2]}{3} \quad \text{Total tangent}$$

Various Types of Energy (no neutral)

$$Wh[0][i] = \sum_{T_{int}} \frac{W[i]}{3600} \quad \text{Active energy consumed phase } i + 1$$

$$VAh[0][i] = \sum_{T_{int}} \frac{VA[i]}{3600} \quad \text{Apparent energy consumed phase } i + 1$$

$$VARhL[0][i] = \sum_{T_{int}} \frac{VAR[i]}{3600} \quad \text{for } VAR[i] \geq 0 \quad \text{Reactive inductive energy consumed phase } i + 1$$

$$VARhC[0][i] = \sum_{T_{int}} \frac{-VAR[i]}{3600} \quad \text{for } VAR[i] \leq 0 \quad \text{Reactive capacitive energy consumed phase } i + 1$$

Total active energy consumed:

$$Wh[0][3] = Wh[0][0] + Wh[0][1] + Wh[0][2]$$

Total apparent energy consumed:

$$VAh[0][3] = VAh[0][0] + VAh[0][1] + VAh[0][2]$$

Total reactive capacitive energy consumed:

$$VARhC[0][3] = VARhC[0][0] + VARhC[0][1] + VARhC[0][2]$$

Total reactive inductive energy consumed:

$$VARhL[0][3] = VARhL[0][0] + VARhL[0][1] + VARhL[0][2]$$

$$Wh[1][i] = \sum_{T_{int}} \frac{W[i]}{3600} \quad \text{Active energy consumed phase } i + 1$$

$$VAh[1][i] = \sum_{T_{int}} \frac{VA[i]}{3600} \quad \text{Active energy consumed phase } i + 1$$

$$VARhL[1][i] = \sum_{T_{int}} \frac{-VAR[i]}{3600} \quad \text{for } VAR[i] \leq 0 \quad \text{Reactive inductive energy consumed phase } i + 1$$

$$VARhC[1][i] = \sum_{T_{int}} \frac{VAR[i]}{3600} \quad \text{for } VAR[i] \geq 0 \quad \text{Reactive capacitive energy consumed phase } i + 1$$

Total active energy consumed:

$$Wh[1][3] = Wh[1][0] + Wh[1][1] + Wh[1][2]$$

Total apparent energy consumed:

$$VAh[1][3] = VAh[1][0] + VAh[1][1] + VAh[1][2]$$

Total reactive capacitive energy consumed:

$$VARhC[1][3] = VARhC[1][0] + VARhC[1][1] + VARhC[1][2]$$

Total reactive inductive energy consumed:

$$VARhL[1][3] = VARhL[1][0] + VARhL[1][1] + VARhL[1][2]$$

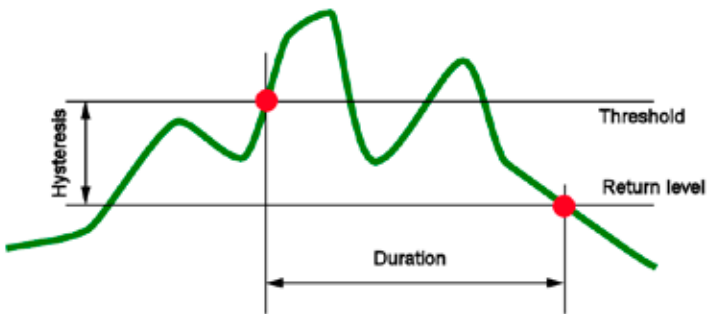
Hysteresis

Hysteresis is a filtering principle, often used after the threshold detection has occurred. A correct setting of hysteresis value will avoid repeated triggering when the measure is varying close to the threshold.

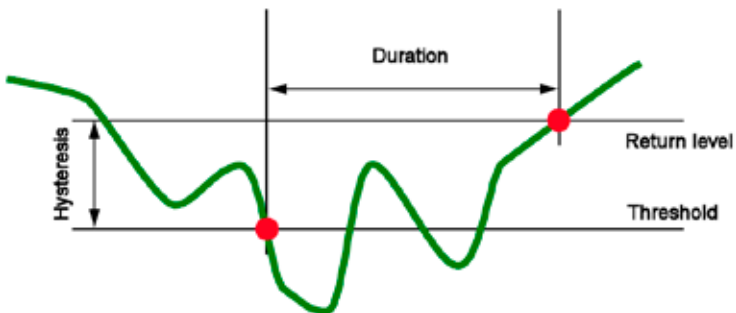
The event detection is activated when the measure is going over the threshold but it can only be deactivated if the measure goes under the threshold minus the value of the hysteresis.

The default hysteresis value is 2% of the reference voltage but it may be set in the range of [1%, 5%] depending on the voltage stability on the system.

Alarm for high voltage RMS (Swell Detection)



Alarm for low voltage RMS (Sag or Interruption Detection)



Minimum scale values for waveforms and minimum RMS values

Type of current sensor	Min RMS current value [A]	Min scale value for current [A]
AmpFlex® 6500 A	30	60
Mini-AmpFlex® 6500 A	30	60
MR193 1000A	1	10
SR193 1000A	0.5	10
MN93 200A	0.5	2
MN193 100A	0.2	1
MN193 5A	$(\text{Primary} \times 5) \div (\text{Secondary} \times 1000)$	$(\text{Primary} \times 5 \times 10) \div (\text{Secondary} \times 1000)$
5A Adaptor	$(\text{Primary} \times 5) \div (\text{Secondary} \times 1000)$	$(\text{Primary} \times 5 \times 10) \div (\text{Secondary} \times 1000)$

- For all types of current sensors

ARMS < [minimum value of displayed current] \Rightarrow [ARMS = APP = APM = W = VA = VAR = WDC = AMAX = AMIN = AhMOD = AhANG = 0] **AND** [flattening of displayed current rates] **AND** [ACF = KF = ATHD = ADF = not calculated and not displayed] **AND** [VAFANG = AFANG = PF = DPF = Tan = not calculated and not displayed]

- For MN193 probe and 5A adaptor

- Primary \in [1 ; 2999] [A] - Secondary \in [1 ; 5] [A]

[min. displayed current value] < 0.2 \Rightarrow [min. displayed current value] = 0.2
 [min. current scale value] < 1 \Rightarrow [min. current scale value] = 1

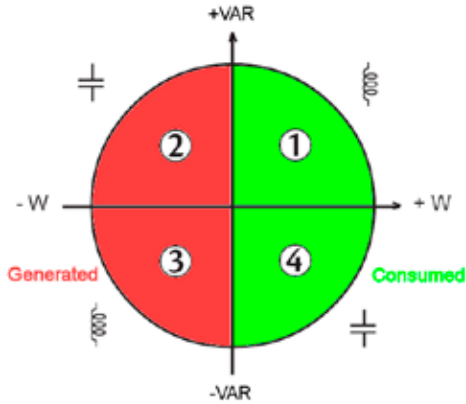
VRMS < 10 V \Rightarrow [VRMS = VPP = VPM = W = VA = VAR = WDC = VMAX = VMIN = VhMOD = VhANG = 0] **AND** [flattening of displayed voltage rates] **AND** [VCF = PST = VTHD = VDF = not calculated and not displayed] **AND** [VAFANG = VFANG = PF = DPF = Tan = not calculated and not displayed]

URMS < 10 V \Rightarrow [URMS = UFRMS = UPP = UPM = UMAX = UMIN = UhMOD = UhANG = 0] **AND** [flattening of displayed voltage rates] **AND** [UCF = UTHD = UDF = not calculated and not displayed] **AND** [UFANG = not calculated and not displayed]

Note: The minimum RMS voltage value is 10V. The minimum scale value for the waveform is 20V.

Diagram of the 4 quadrants

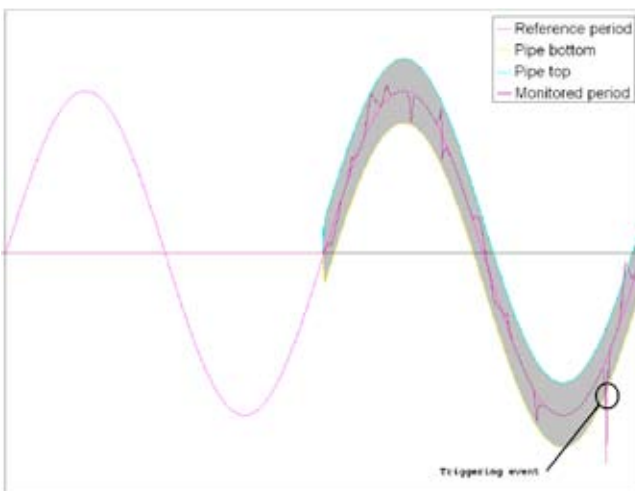
This diagram is used as part of measuring power and energy (see § 5.2)



Mechanism for triggering transient sensors

The sample rate is a constant value equivalent to 256 samples per cycle. When a transient search is launched, each sample is compared to the sample from the preceding cycle. The preceding cycle matches the middle of the tube; it is used as a reference. As soon as a sample leaves the tube, the trigger event comes; representation of the transient is then captured by the PowerPad®. The cycle preceding the event and the three following cycles are saved to memory.

Here is a graphical representation of the transient capture trigger mechanism:



Here are the tube half-widths for voltage by type of sensor:

Threshold	100%	50%	20%	10%	5%	2%	1%	Type
Pipe half-width (L)	199.79	99.88	39.96	19.97	9.97	3.98	1.98	MN 200A
	99.90	49.94	19.98	9.98	4.99	1.99	0.99	MN 100A
	2997	1498	599	299	150	60	30	MN 5A / Adapter box 5A [3000 / 1]
	0.9990	0.4994	0.1998	0.0998	0.0499	0.0199	0.0099	MN 5A / Adapter box 5A [1 / 1]
	999.0	499.4	199.8	99.8	49.9	19.9	9.9	SR / MR 1000A
	3002	1500	600	300	150	59	29	AmpFlex / MiniFlex 3000A
	499.0	249.5	99.8	49.8	24.9	9.9	5.0	Voltage 500V

Sensor Conditions in Ringing Current Mode

Reminder: Sensors depend on the trigger event and a stop event. If the capture ends with a stop event or if the save memory of the PowerPad® is full, capture stops automatically.

The stop threshold for capture is calculated as follows:

$$[\text{End threshold [A]}] = [\text{Start threshold [A]}] \times (100 - [\text{End hysteresis [\%]}]) \div 100$$

Here are the conditions for triggering and stopping capture:

Triggering filter type	Start and end conditions
A1	Start condition ⇔ [A1 half-period RMS value] > [Start threshold] End condition ⇔ [A1 half-period RMS value] < [End threshold]
A2	Start condition ⇔ [A2 half-period RMS value] > [Start threshold] End condition ⇔ [A2 half-period RMS value] < [End threshold]
A3	Start condition ⇔ [A3 half-period RMS value] > [Start threshold] End condition ⇔ [A3 half-period RMS value] < [End threshold]
3A	Start condition ⇔ [the half-period RMS value of one current channel] > [Start threshold] End condition ⇔ [the half-period RMS values of all current channels] < [End threshold]

APPENDIX B

GLOSSARY OF TERMS

Ampere: unit of electrical current intensity (A symbol).

Bandwidth: frequency range on which an instrument supplies a precise measurement.

Fundamental component: component whose frequency is the fundamental frequency.

Cut: reduction in voltage at a point in the electrical power network below the cut threshold.

Voltage dip: temporary reduction in the voltage amplitude at a point in the electrical power network below a given threshold.

Imbalance in voltage in a polyphased electrical power network: status where efficient values for voltages between conductors (fundamental component) and/or differences in phase between successive conductors are not equal.

Peak factor: relation between the peak value and efficient value of the current.

Phase displacement factor: relationship between the active power and apparent power of the fundamental component.

Power displacement factor: expresses the difference between the apparent and active power when and only when the relationship of the voltage phase and current to the fundamental is taken into account.

Factor K: number based on the contents of a harmonic of a charge current that determines the maximum load on a source of energy. The K factor calculated by the PowerPad® is measured and compared with the one specified by the transformer manufacturer. It gives the percentage of “harmonics load” of the transformer.

Power factor: relationship between active and apparent power.

Flicker: The visual effect produced by the variation in electrical voltage.

Frequency: number of full voltage cycles produced in one second.

Harmonics: voltage and current existing in electrical material at frequencies that are multiples of the fundamental frequency.

Hysteresis: difference in amplitude between threshold incoming and outgoing values.

Peak: maximum (+) or minimum (-) peak value of the signal.

Phase: temporal relationship between current and voltage in alternating current circuits.

PST: (*Short term perception*). Calculation of flicker over a ten minute cycle.

PLT: (*Long term perception*). Calculation of flicker over a two-hour cycle.

Harmonics level whole number equal to the relationship between the frequency of the harmonic and the fundamental frequency.

RMS: Root Mean Square. Efficient value of a current or voltage.

Dip threshold: specific voltage value to detect the start and end of a voltage dip.

Temporary surge at industrial frequency: temporary increase in the voltage amplitude at a point in the electrical power network above a given threshold.

Nominal voltage: voltage by which a network is named or identified.

THD: Total Harmonic Distortion. The rate of total harmonic distortion gives the influence of harmonic components in a signal.

Measurement method: all measurement methods associated to an individual measurement.

Phase and route: a measurement route corresponds to a difference in potential between two conductors. A phase is a simple conductor. In polyphased systems, a measurement route can be between two phases or a phase and neutral or a phase and earth or neutral and earth.

Watt: unit of measurement for power (W symbol).

Repair and Calibration

To ensure that your instrument meets factory specifications, we recommend that it be scheduled back to our factory Service Center at one-year intervals for recalibration, or as required by other standards or internal procedures.

For instrument repair and calibration:

You must contact our Service Center for a Customer Service Authorization Number (CSA#). This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container. If the instrument is returned for calibration, we need to know if you want a standard calibration, or a calibration traceable to N.I.S.T. (Includes calibration certificate plus recorded calibration data).

Ship To: Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive
Dover, NH 03820 USA
Phone: (800) 945-2362 (Ext. 360)
(603) 749-6434 (Ext. 360)
Fax: (603) 742-2346 or (603) 749-6309
E-mail: repair@aemc.com

(Or contact your authorized distributor)

Costs for repair, standard calibration, and calibration traceable to N.I.S.T. are available.

NOTE: You must obtain a CSA# before returning any instrument.

Technical and Sales Assistance

If you are experiencing any technical problems, or require any assistance with the proper operation or application of your instrument, please call, mail, fax or e-mail our technical support team:

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
200 Foxborough Boulevard
Foxborough, MA 02035 USA
Phone: (800) 343-1391
(508) 698-2115
Fax: (508) 698-2118
E-mail: techsupport@aemc.com
www.aemc.com

NOTE: Do not ship Instruments to our Foxborough, MA address.

Ship To: Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments

Limited Warranty

The PowerPad® Model 8335 is warranted to the owner for a period of one year from the date of original purchase against defects in manufacture. This limited warranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused or if the defect is related to service not performed by AEMC® Instruments.

For full and detailed warranty coverage, please read the Warranty Coverage Information, which is attached to the Warranty Registration Card (if enclosed) or is available at www.aemc.com. Please keep the Warranty Coverage Information with your records.

What AEMC® Instruments will do:

If a malfunction occurs within the one-year period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will, at its option, repair or replace the faulty material.

**REGISTER ONLINE AT:
www.aemc.com**

Warranty Repairs

What you must do to return an Instrument for Warranty Repair:

First, request a Customer Service Authorization Number (CSA#) by phone or by fax from our Service Department (see address below), then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment pre-paid to:

Ship To: Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive • Dover, NH 03820 USA
Phone: (800) 945-2362 (Ext. 360)
(603) 749-6434 (Ext. 360)
Fax: (603) 742-2346 or (603) 749-6309
E-mail: repair@aemc.com

Caution: To protect yourself against in-transit loss, we recommend you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

NOTES:



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